THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVII. No. 2157.] LONDON, SEPTEMBER 13, 1904. [56TH YEAR. PRICE 6d.

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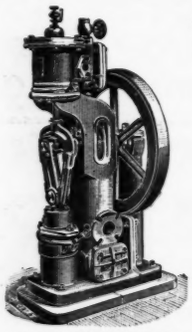

Fig. 705. "SINGLE RAM" STEAM-PUMP.

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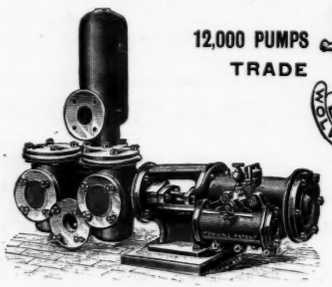

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

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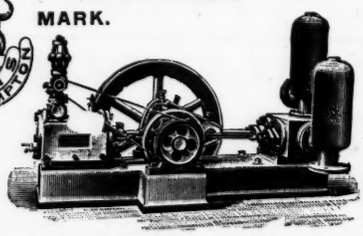

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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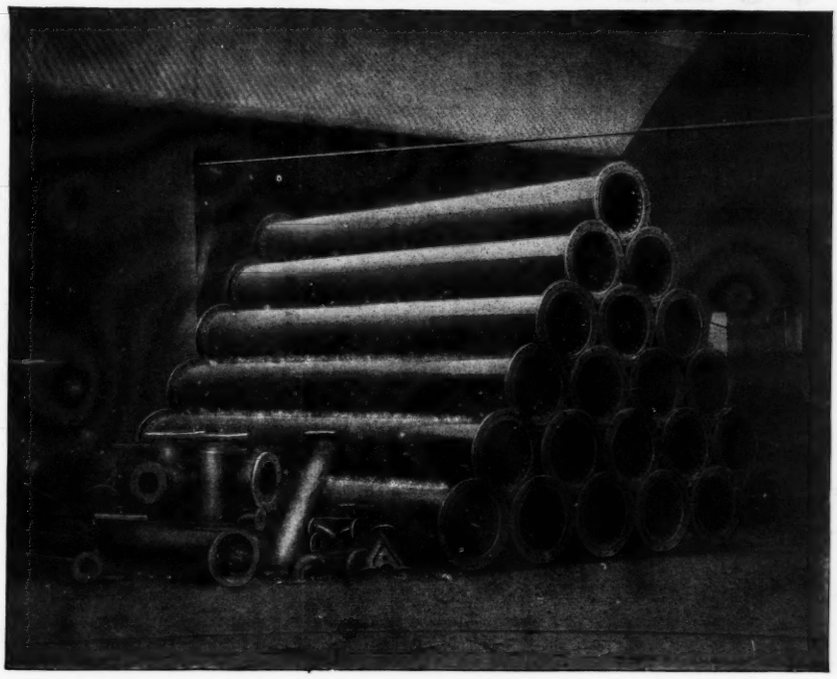

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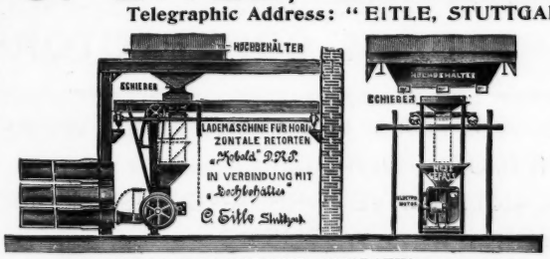

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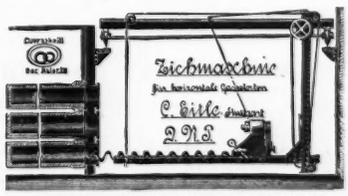

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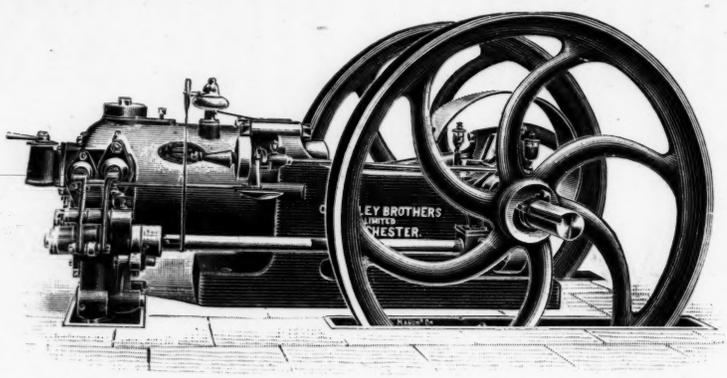

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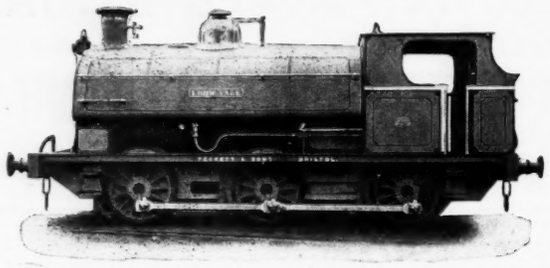

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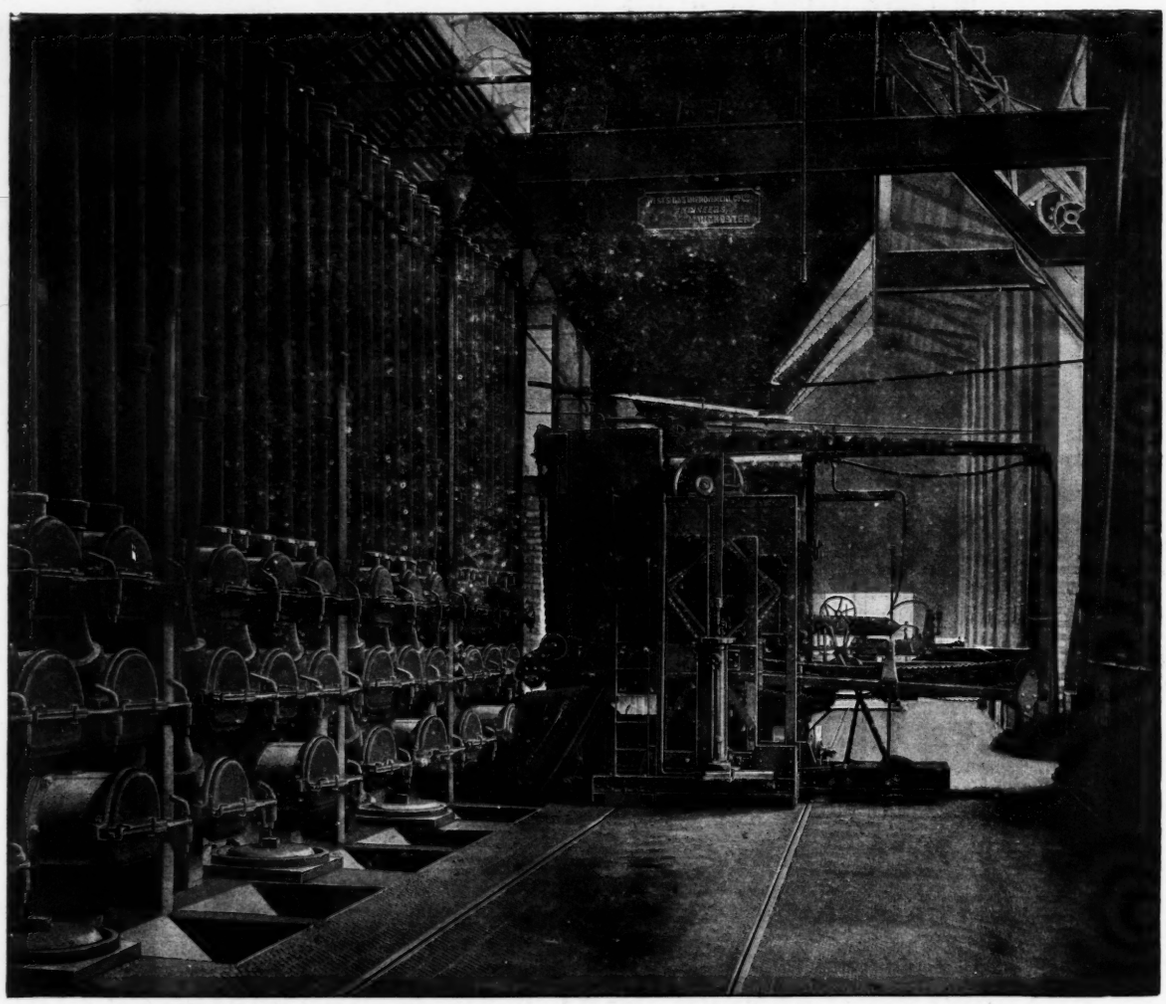

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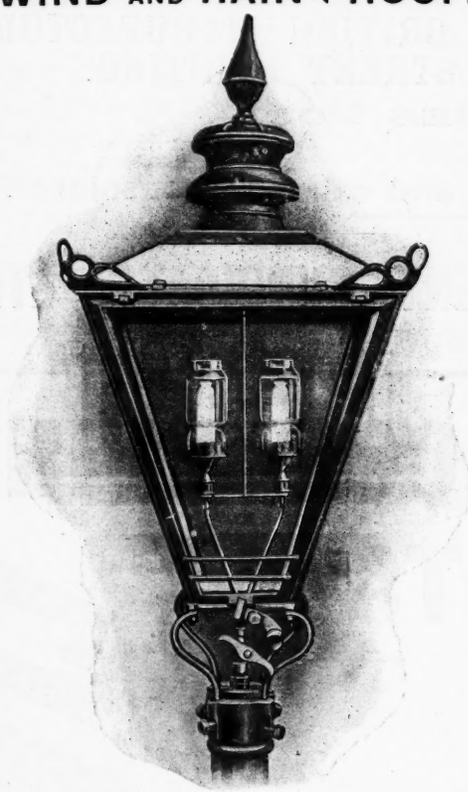

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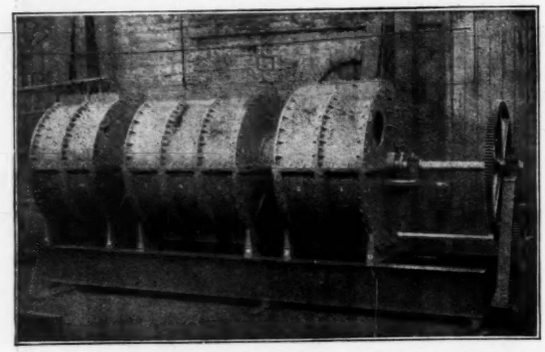

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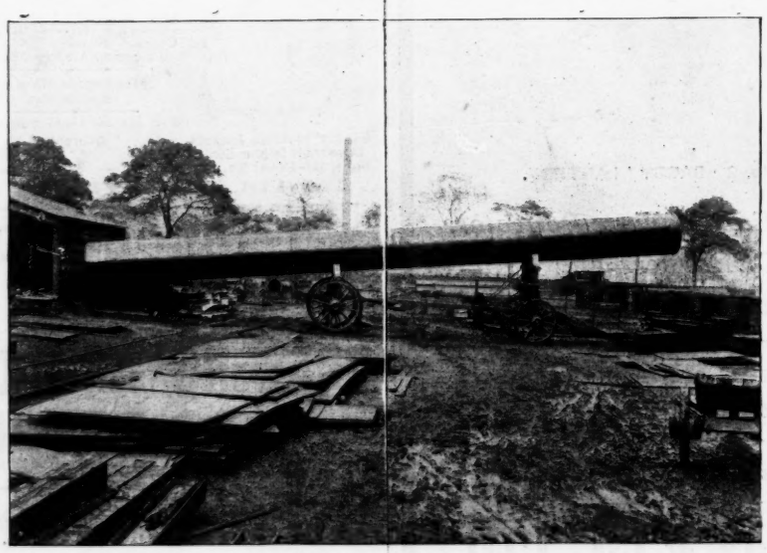

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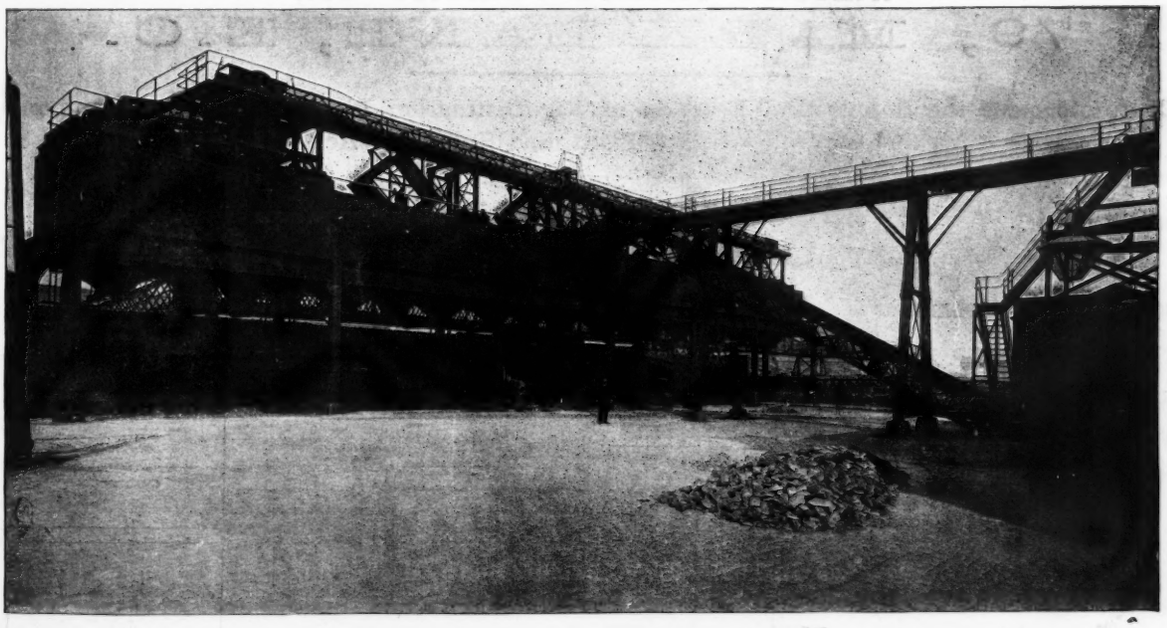

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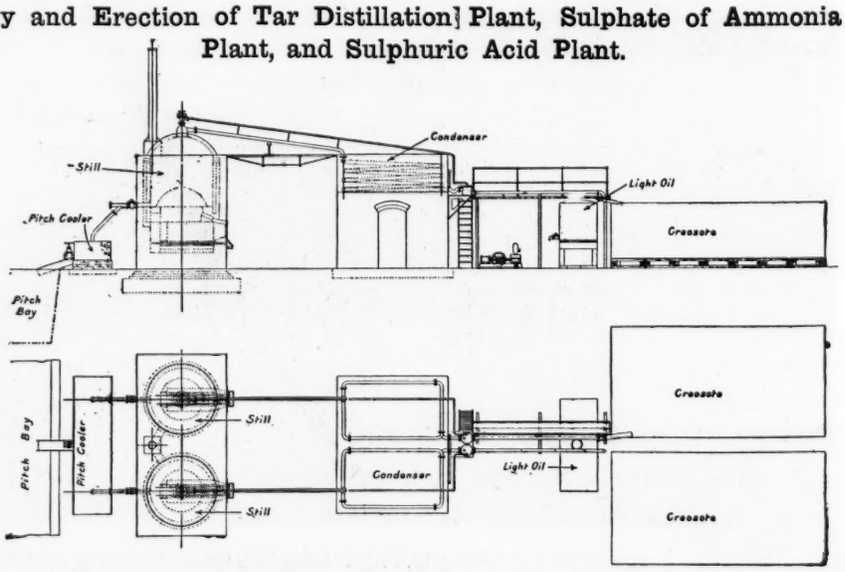

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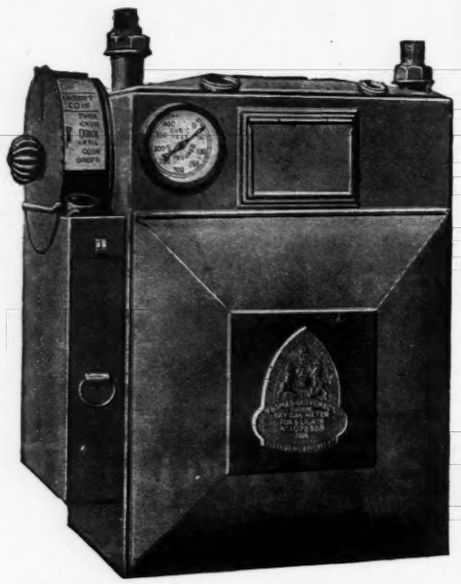

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EDITORIAL NOTES—GAS, &c.

The New Provan Gas-Works—Constructional Business in the Gas Industry.

To-morrow the first section of the great works which have been built at Provan for the Glasgow Corporation Gas Department will be inaugurated, with due ceremony, in the presence probably of a company numbering 300; and to-day we give the opening article, with plates and other illustrations, which will assist to convey to those who have not been to Provan and who may never have an opportunity of doing so, some idea of the character of these magnificent works. There is one thing that must inevitably course through the inaugural proceedings, and that is a feeling of sincere regret that Mr. William Foulis, the originator and designer of the works, is not among us to witness the consummation of his scheme, to rejoice with the Corporation and others in its completion and bringing into active operation, and to receive the congratulations of his professional friends. Of those who were wont to associate with Mr. Foulis, and to discuss with him topics of technical moment, there will be many present at Provan to-morrow to inspect the masterpiece upon which their late friend spent so much time, and into the perfecting of which he had of late years thrown practically his whole energy—at any rate, so far as health would allow. The principles which guided him in the design were substantiality, efficiency, and economy, but not an economy detrimental to either the one or the other of the two former. There were, however, great obstacles to the attainment in the building of works at Provan, of the ultimate economy which Mr. Foulis would have secured if only he had had placed before him a site without any of the undulations, inclinations, and other drawbacks of the ground at Provan. And yet what matters that he was not able to get within his grasp that ultimate economy in first outlay, when, through that inability, and through the very difficulties of the virgin site, he has evolved a system of operation at the new works which must make for economy in working. Herein are found the wisdom and the skill of the engineer. Mr. Foulis left behind him some faithful colleagues; and his successor and former chief helper in the engineering department (Mr. Alexander Wilson) and all under him will work to make what their late chief intended Provan to be, both in form and effect. The opening of the works to-morrow will also, we are afraid, mark a last public appearance before the severance of another long association with the Glasgow Gas Department; it being understood that the Convener of the Corporation Gas Committee (Mr. R. M. Mitchell) has signified his intention of retiring before the close of this year. There was only one thing that he desired before handing over the reins of office, and that was to see the first section of the big works at Provan, in which he had been so intimately bound up with Mr. Foulis, brought to a successful finish, and made part and parcel of the great producing system of the department. The voluntary work which Mr. Mitchell has given to the department has been long, valuable, and self-sacrificing; and from its administrative work his name—though in person he be so—can never be dissociated.

This opening of the first section of the Provan works, and a consideration of the large amount of constructional work it has involved, lead the thoughts into other channels. Last year the complaint was fairly general that there was not a large amount of employment going for gas-works plant builders; and if there was not then, the prospect for the moment does not appear to be any brighter. Last year, there were gas-plant works where full time was not being worked; while others appeared to be getting a lion's share of any of the work that happened to be going. The position seems to be much the same to-day. Of course, there is, time after time, extension work of a fairly considerable character going on. This must be so in connection with an industry that is developing at the rapid rate of that in which readers are concerned; but the immediate prospect of a boom in construction work is not great. There are no Provans, Grantons, and other large new works projects (excepting those in hand) looming ahead; and the parliamentary work of the past session was not of an order that gives promise of much in this way. At the same time, while (according to report, and from what can be seen on the surface) the outlook is somewhat dull, there are, as we have said, always the extensions to keep things from going absolutely flat; and the extensions that are made in these days of colossal growth in the industry are somewhat different from what were the rule in times not so long ago but that most of us retain vivid recollections of them. Of course, these are times, too, in which many gas engineers who can manage to do so are playing a waiting game. They see in the circumstances of to-day a little uncertainty; and they are not confident as to the future. There is not much doubt now as to the trend of things in respect of the character of the supply of gas; and the dubiety which has existed as to the future of manufacture has been drawn in (through the settlement of the sulphur compounds question by the Board of Trade Committee) so as to embrace only carbonizing methods. When we know more about the results, after extended trial, of the new charging and drawing machinery, and learn from Mariendorf the results of the working of the vertical retort system of carbonization there, and from the Settle-Padfield and other vertical methods, the results of their experiments and working under manufacturing conditions, then (with the removal of doubt) there must be a gradual settling down again, and a stimulation of constructional work in the carbonizing field. So that while work may be found a little dull just now, excepting by the more fortunate firms, and the immediate prospects not extraordinarily bright—with the increasing prosperity of the gas industry, and the greater knowledge of the relative efficiency of new systems, there must come, and that not far ahead, a fresh spurt in constructional activity.

The reported temporary dullness in gas engineering work is only what is found in other branches of engineering. We have but to look at the monthly returns relating to the percentage of employed and unemployed men in the engineering trade, to obtain confirmation as to this. No matter which district one looks at in the returns, such expressions as employment "quiet," "dull," "moderate," "bad," and "slack" are frequent; and the general condition of things is summed up in the statement that "employment generally "continues dull, and worse than a year ago." The percentages of unemployed in the engineering trade are much greater in the Lancashire, Yorkshire, and Midland districts than they were in the corresponding months of last year; but, taken as a whole, Scotland shows up worse. In iron and steel works, too, the number of people employed exhibits a decline as compared with a year ago; and employment in the pig-iron industry also presents a falling off—the number of furnaces in blast showing a very substantial decrease as compared with a year ago. All this goes to prove that trade generally in constructional engineering is far from being at its best; and that the temporary depression of which we hear reports, is not peculiar to the branch specially engaged in looking after the requirements of the gas industry. Perhaps, in the circumstances, this would not be a bad time for gas undertakings to enter into contracts for plant which they see they must require, if not immediately, at a time within reasonable distance.

A Deceptive Foundation to a Case for Municipalization.

The "Municipal Journal" has been casting gibes at the Bishop's Stortford District Council for having taken the "extraordinary" course of inviting Sir George Livesey, "a well-known anti-municipalist, and Chairman of the "South Metropolitan Gas Company, to advise it upon "the proposal to purchase the undertaking of the local Gas "Company." The selection of Sir George as an adviser in such a matter is, of course, against what our red-hot municipalistic contemporary regards as according with the

fitness of things; and an expert with a tendency towards municipalization would have been more compatible with its ideas. Sir George's outspoken denunciation of the proposed purchase has naturally occasioned terrible vexation in those circles in which the gospel of municipal trading is venerated —to our passionate little contemporary among the number. One of its editorial staff this week has sought to set things right, so far as Bishop's Stortford is concerned, by making up a case from the official returns relating to gas undertakings to show the superiority of the municipal management of gas-works, as compared with those under company administration. The writer produced a number of figures from the returns which he refers to as "facts," and which he accuses Sir George of having smothered in advising the District Council of Bishop's Stortford. We should not have referred to the matter if the "Municipal Journal" had not supplied an example of the misuse that can be made to support any case almost of statistics such as those to be found in these returns. In dealing with them, account must, of course, be taken of all the attendant circumstances. But it would have been fatal to his case if the writer in question had looked "further than his nose" in making a choice of the figures which he put before his readers generally, and particularly before the Bishop's Stortford District Council; or, it may possibly be, that his capacity for seeing beneath gas statistics is not on the same high level as that of Sir George. We will readily admit first that the figures in the returns are facts; and we also gladly and freely admit that there are municipal gas undertakings equally as well managed as company undertakings. But we do not, on the figures of the returns, admit the accuracy of the contention of the "Municipal Journal," that the inhabitants of a district are better served under municipal than they would be under company administration. Moreover, some of the principal figures taken to show how wrong is Sir George, relate to towns and cities out of all proportion in size, population, and environment, to comparatively insignificant Bishop's Stortford.

The points which the municipal writer takes from the returns are: That the capital outlay of the 256 local authorities mentioned in the returns was £35,738,023, against £77,129,037 for the 454 companies; that a net revenue of £2,339,482 was realized by the former, as compared with £4,037,906 by private enterprise; that the return from the capital invested was respectively 6½ per cent as against 5½ per cent.; that the ratio of expenditure to income was 75·51 per cent., as compared with 76·53 per cent.; and that the average charge for gas is 3d. in favour of the local authorities—the figures being 2s. 8d., as compared with 2s. 11d. Then the thousands of pounds set aside out of the gas profits in aid of the rates, by such places as Birkenhead, Manchester, Leicester, Bolton, Wigan, and Belfast, are quoted. It is amusing to see these referred to in the same breath as Bishop's Stortford. However, on these figures, it is held that municipal management of gas supply is preferable to company administration, and is quite the proper thing to be applied to Bishop's Stortford. Two or three points for the consideration of the municipal advocate should be sufficient to show that his reasoning is fallacious. In the first place, he does not recognize the fact that the local authorities have acquired in the main some of the choicest gas-supply districts to be found in the country—in point of thickness of population and industrial establishments, and accessibility to the coal-fields; whereas the great majority of the companies are in a much less favoured condition in respect both to custom and geographical position relative to the sources of supplies. Under such circumstances, it is not to be marvelled at that, taken collectively, the former should make a better showing in certain respects than the companies. Their territorial conditions contribute to greater success in respect both of capital and working expenditure. Look at Lancashire for example, thick with cities and towns in which there is a great demand for gas for both industrial and ordinary purposes. The returns show that in that county there are 42 undertakings in municipal ownership, as against 29 in the hands of companies. Take Kent as the antithesis. The returns show only four municipal-owned undertakings, as compared with 25 in the hands of companies. Contrast the two counties from the standpoints of solidity of populations and their relative situations for obtaining coal supplies! The circumstances of some of the undertakings in Kent, however, would more nearly approximate to those of Bishop's Stortford. Again, turn to Yorkshire. There 38 undertakings are found in the hands of local authorities, as against 53 in the possession of companies. But the condition of the majority of the companies is certainly not that of the local authorities in the matter of choice districts. This is shown by the capital required. Of the local authorities, there are only 16 with a capital less than £50,000; while of the companies there are that number with a capital of less than £10,000, and altogether there are 33 with capitals of less than £50,000. These are influences which either did not strike the writer in our contemporary, or he refused to see them in order not to jeopardize his case. It must be that the greater density of population and facility in getting supplies in such a large proportion of the municipalized undertakings has a substantial effect on the results. But whatever the sum of that effect, it is not evidence that "public enterprise "scores over private enterprise in efficiency and economical "management." Comparisons must be made on comparable bases before useful conclusions can be drawn.

If the writer in our contemporary will turn to "Field's "Analysis," he will there find the returns of nine representative provincial Local Authorities and eight representative provincial Gas Companies; and some interesting comparisons can be readily made of the figures. For instance, he will see that the capital employed per 1000 cubic feet of gas sold by the municipalities is 10s. 1od.; and by the companies 9s. 9d.; that the mileage of mains of the former is 3334, as against 2071; and that the number of private consumers per mile of main is respectively 174 and 134, showing a greater density of population in the case of the authorities' undertakings. Furthermore, he will see that the net gas-rental received per 1000 cubic feet by the municipalities is 29·35d., and by the companies 4·03d. less; and that the total working expenses are respectively 13·67d. and 13·47d. per 1000 cubic feet. These are some figures which the "Municipal Journal" may not find it quite easy to digest. Bringing into comparison these Local Authorities and Companies, of fairly equal dimensions—though the former, as is shown by the mileage of mains and number of consumers per mile, are of the two better circumstanced—do the results prove that "public enterprise scores over private enterprise in effici-"ency and economical management?" We think not. With new light thrown on the subject, perhaps our contemporary will reconsider whether the aggregated figures of the Board of Trade returns are a satisfactory foundation for its case, and really prove the applicability of that case to Bishop's Stortford. If it is possible for prejudice to be set aside, we have no fear as to the result of the review, more especially as, in another part of the last issue, the unfairness of comparing electricity returns from South Coast undertakings with districts in Lancashire and Yorkshire is strongly asserted. This looks hopeful.

The Purification of Gas by Ammonia.

To-day we publish the last instalment of the communication bearing the above title, in which Mr. Holgate gives the results upon the financial side of a works employing revivified ammoniacal liquor. In the comparisons instituted, it has been shown what a good position is attained by that works, and (incidentally) the high position that the South Metropolitan Gas Company—who are partial users of an analagous system—occupy relative to the other London Gas Companies. The approval of this principle of working and a contemplated extension of its operation by the South Metropolitan Gas Company was recently expressed in the evidence given by their Chief Engineer (Mr. Charles Carpenter) before the Board of Trade Committee on Gas Testing. It is gratifying to those who believe in the economic advantages of ammonia purification to be able also to point to the Waterford Gas Company as one where for a considerable term of years the saving due to this principle has been realized. We are informed that, upon this point, the veteran Mr. George Anderson, and his son and successor Mr. R. Bruce Anderson, have quite satisfied themselves, and that they find the method applicable to works making annually 100 millions and upwards.

The advantages of what we believe, by common consent, may be called a rational system, do not terminate with the removal of the disabilities of the general practice in gas purification, but open up possibilities worthy of full and careful consideration. Some of these have been hinted at in the text of the communication; but they may be more explicitly referred to as the recovery in a marketable form

of some of the impurities hitherto neglected or of others imperfectly utilized. The most important of these—as to magnitude and facility of removal, separation, and recovery—is undoubtedly carbon dioxide, which in the liquid or solid form is saleable at an attractively high figure. The technical processes by which this liquefaction can be accomplished are in successful operation; but it is unnecessary now to further mention them, except to show that means are at hand for those gas engineers who, while effecting the purification of gas at a cheap rate, may be ready to increase their receipts by a hitherto neglected residual.

Though the advantages of manufacturing anhydrous liquid ammonia, carbonate of ammonia, and the recovery of hydrocyanic acid and carbon bisulphide or other compounds are not so obvious as that of solid or liquid carbonic acid, yet it is, we hope, not unreasonable to suggest that these questions should be borne in mind, and that they may well be considered in relation to ammonia purification, as contrasted with the methods at present in use. More than this it would, perhaps, be unwise to urge at the moment, because these developments must, in the natural order of things, follow or be deferred until in any particular works a practical application of the fundamental principle has been made. That is of sufficient practical importance to receive attention undistracted by the eventualities we have sketched. We have been gratified by evidence of interest manifested in this brief series of articles, and we hope that this revival of an important subject will be productive of substantial benefit to the gas industry at large.

A Word to Electricity Power Companies.

We are reminded once more of the Electricity Supply Bill by a plaint of Mr. A. G. Lupton, the Chairman of the Yorkshire Electric Power Company. In addressing the shareholders a few days since, he spoke in somewhat doleful tones of the fact that the administrative expenses had been swollen by an amount exceeding £900, and there is yet a further sum to come into the next balance-sheet. Mr. Lupton charges certain Local Authorities in the Company's district with having been at the bottom of this additional expense; and he may be reminded that, if the Electricity Supply Bill ever gets into the statute book, there will be much more of the same sort of thing to encounter owing to the privileges of local authorities to supply each other in bulk and to combine for supply. The expense of which he complains is occasioned through the craze for municipal trading. Local authorities not content with supplying electricity within their own areas—this was quite a feature of the legislative programme of the municipalities last session—have been seeking to go outside them, and risk the money of the ratepayers by competing with these big power companies whose parliamentary powers allow them to rove through large districts at their own sweet will, excepting where the local authorities have distributing powers, and these are protected. But the protection given to the latter does not shield the power companies from attacks by the authorities. While not in love with these huge companies, we are even less so with the feverish speculative tendencies of certain local authorities. These are bad enough within their own areas, but the extension of their liberties beyond is something that it is to be hoped Parliament will never countenance. Therefore, it is a pleasure to learn that in every case fought by the Yorkshire Electric Power Company, Parliament upheld the Company and repulsed the municipalities in a very decisive manner. We trust that this is a good omen as to what will happen when the Electricity Supply Bill again puts in an appearance. If it succeeds, then—the electric power companies should consider this—the position of the municipalities will be strengthened, and their own correspondingly weakened. This being so, if they do not put in a strong resistance to the Bill in question when next the opportunity arises, they will only have themselves to blame if the local authorities score any additional advantage. As opponents, the Yorkshire and other power concerns will find themselves in excellent company.

Waverley Association Meeting.

The Waverley Association meeting held at Melrose last Thursday completes the Scotch circuit of meetings of gas managers for the year. It was, as the Waverley meetings always are, a very pleasant gathering. The Association does not soar to high altitudes, either on the scientific or the working side of the profession, but contents itself with "spade work," which is doubtless the secret of its continued prosperity. On this occasion, Mr. J. Gemmel, the President, elected to dig in his own vineyard only, which had this great merit, that he brought before his brethren only matters with which he was perfectly cognizant, and matters, too, in which they could all follow him—more particularly so when he took them first to the gas-works, and showed them the objects which he had made the subject of his address. That he was followed was shown by the interesting discussion which resulted, the distinguishing characteristic of which was that it never got off the rails, as is often the case. The "unvarnished tale," which Mr. M'Gilchrist described the Presidential address to be, provided sufficient material for the members to dwell upon; and there was not a single remark which did not arise directly out of the address. This is, in reality, the highest compliment which could be paid to any President. The address divides itself into the two parts of, first, how to avoid creating difficulties; and, secondly, how to overcome any unforeseen difficulty which may arise. In his own working, he has everything so carefully thought out that his narrative reads quite like the description of a gas-works Paradise; while his account of how he cobbled up a fractured retort, keeping the other retorts in the bench at work all the time, has a spice of romance in it. It is matter of congratulation that there exists a body such as the Waverley Association, devoting its attention exclusively to the small affairs of the gas industry; and, on this occasion, hearty thanks are due to Mr. Gemmel for his contribution to the literature which is of more interest to a very large section of the gas industry than would have been a more ambitious production from his pen. Meeting in the heart of Scott's country, it was most appropriate that the Association should visit the shrine of the great novelist, from whose works the Association derives its name. The excursion to Abbotsford was one of the most enjoyable in which the members have ever taken part.

Labour Leaders in Congress.

Labour—or so much of it as is represented by Trades Union Executives—has been having a busy time at Leeds during the past week. The Town Hall, and a very considerable portion of the space at the disposal of the local Press, have been filled with the sayings of representatives at the Trades Union Congress; but what tangible outcome there is to be from it all, goodness only knows. Resolutions on all sorts of subjects have been passed—there were some eighty or ninety down on the *agenda*—and the delegates have had ample opportunity to impress their own particular views on the gathering. The Government generally, and Mr. Chamberlain especially, came in for a large amount of attention—indeed, the President, Mr. R. Bell, M.P., seems to have devoted his address mainly to a criticism of the doings of Parliament. If, however, any of the delegates were disappointed in this respect, they did not have long to wait for more diverting fare; for Mr. Shackleton, the member for Clitheroe, shortly afterwards treated them to an attack on Mr. John Burns, in the course of which he delivered himself of the statement that "We do not recognize him (Mr. Burns) as a member of the Labour group." However, the storm passed, and the Congress presently proceeded to the question of the establishment of a Labour newspaper, which had been reported upon adversely by the Committee who had been authorized to consider it. This, again, led to an attack on one of the members—this time the President himself—on account of his connection with a paper now dead; and later on another scene arose over the way in which the President saw fit to expedite the business of the meeting. All this took place on the consideration of the report of the Parliamentary Committee; and when that had been adopted, things quieted down a little. It was a pleasant change from all the bickering to find a genuine burst of enthusiasm evoked by Mr. John Ward, of the Navvies' Union, when he said that the Congress should note with great satisfaction the remarkable progress made in the principles of peace since King Edward came to the throne. "As a matter of fact," he added, "the King is about the only statesman England possesses." The applause which greeted this loyal sentiment having subsided, the delegates proceeded to consider the fiscal question, old-age pensions, the Factory Acts, the eight-hour day, and various other matters of interest to sections of the members represented. At a subsequent

sitting, the housing question was discussed; and it is pleasing to note that here, too, some of the heartiest cheers heard during the Congress were given to endorse a remark that the movement "had not only the sympathy of the highest gentleman of the land, but also of Queen Alexandra." Of course, no meeting of this kind would have been complete without some reference to Chinese labour in the Transvaal; and accordingly the matter was discussed in connection with a lengthy protesting resolution, which led to some talk of a rather fiery nature. But is the cause of Labour in any way advanced by all these rhetorical fireworks?

The Workmen's Compensation Act.

Perhaps one of the most important resolutions submitted to the Congress, and carried by a very large majority, was that which declared that any satisfactory amendment of the Workmen's Compensation Act must provide for: The inclusion of all workmen who meet with an accident, or incident dangerous to their health, arising out of, or in the course of, their employment. The expression "workmen" is to include every person who had entered into, or worked, whether by manual labour or otherwise, under a contract of service or apprenticeship, with an employer in the United Kingdom, or on board a British ship, whether the contract was expressed or implied, or was oral or in writing. Payment from the date of accident of not less than 50 per cent. of what the man would have earned had he been employed full time. Payment to a minor to be based upon the ultimate loss which such person, becoming an adult, might sustain. Wilful and serious misconduct to be restricted to acts of an aggravated character. Compensation to be payable to dependants—meaning relatives and guardians who had either been maintained in the past or were being maintained by the injured person. That men, equally with employers, should have power to apply for commutation by lump sum; and that the weekly payment to a workman who had met with a permanent injury should not be terminable except by commutation equal to not less than 75 per cent. of the actuarial value of the weekly payments. The onus to be thrown upon the employer to prove that the particular workman fully understood at the time the terms of settlement, and was cognizant of the rights he possessed under the Act. Where compensation had been paid to an injured person, the employer should be compelled under a penalty to register an agreement in the County Court. If the Congress would confine itself to questions of this character, and eschew politics, greater practical results might arise from its deliberations than are at the present time traceable to them.

Gas and Electricity in England

Quite a number of interesting particulars regarding the present position of the electric light industry in this country were given by Sir Frederick T. Mappin, Bart., in his address last week to the shareholders of the Sheffield United Gaslight Company. It is, of course, true that the wealth of material at hand renders fairly easy the task of satisfactorily demonstrating the enormous gap in the matters of economy and profit-earning capacity that separates gas from its would-be rival; but their collation and setting forth in so prominent a manner deserve grateful acknowledgment. To talk is one thing; to induce people to pay heed to one's remarks is sometimes quite another matter. This latter is, however, not a difficulty that is likely to be encountered by Sir Frederick, who, besides being certain of an attentive hearing locally, is sure of having his words carefully weighed wherever his name is known. For this reason we welcome the plain, unvarnished tale unfolded by him last Tuesday, though there may be nothing in it but what "JOURNAL" readers are already fully acquainted with. The experiences of Hastings, West Ham, Shoreditch, and many other places also, are quite familiar in the gas world—as well as to the ratepayers directly concerned; but no opportunity should be lost for bringing them (as has been done on the present occasion) before those who may be fortunate enough still to be in a position to profit by the lessons which they convey. So far as the Sheffield Company themselves are concerned, the position is well indicated by the statement of the Chairman that the consumption 23 years ago was 1131 million cubic feet, whereas last year it was 2718 millions, or an increase of 140 per cent. And the output of the past six months tells the same tale—an increase over the corresponding period of 1903. Along with this enormous growth of business, the consumers have naturally enjoyed substantial concessions in price; there having been since 1881 a reduction of somewhere about 30 per cent. in this respect. A timely warning was sounded by Sir Frederick with regard to the unwisdom of builders installing only electric light fittings in new houses, and leaving out gas-pipes altogether—a practice which Mr. Thompson, the Engineer of the Melbourne Gas Company, had found now to obtain in many parts of England. Among the other matters touched upon at the Company's meeting, we note that the question of inaugurating at Sheffield a profit-sharing scheme on the lines of that in vogue with the South Metropolitan Gas Company has not been considered by the Board, as "it is not a system which prevails in the locality." Perhaps, however, when they do look into the matter, the Directors may decide to set the neighbourhood an example in this direction.

And in Australia.

Turning to gas affairs on the other side of the world, we find just the same record of progress as is the case here. In this as in other matters Australia keeps in line with the Mother Country. Both the Metropolitan of Melbourne Gas Company and the Australian Gaslight Company of Sydney report substantially increased receipts from sales of gas; the former remarking that the most gratifying feature of the past half year was the number of new consumers secured. Like the Chairmen of similar undertakings in England, those at the head of Gas Companies in Australia have a good deal to say on the subject of electricity; and the gist of the remarks is much the same. In Melbourne, the cost of electricity for lighting purposes, candle power for candle power, is more than five times as much as gas; while electric motors with current at 2d. per unit are found to be twice as dear as gas-engines with gas at 4s. per 1000 cubic feet. Notwithstanding these facts, however, the Corporation—not to be outdone by so many English municipal authorities—are manifesting an inclination for incandescent electric street lights. Some re-arrangement of the method of local taxation in Sydney has forced the Gas Company to increase the charge for public lighting in one borough, with the result that the supply to the street lamps in that portion of their area has been lost to them; but, as already remarked, the prosperity of the Company is unaffected by competition. The balance-sheet of the Perth Gas Company does, however, contain some figures to which in this country we are unaccustomed. The revenue from the sale of gas, &c., for the six months to May 31 amounted to £7833, while that from electric current, &c., was £16,154; the profit on the gas being £1930, and on the electricity £6442. But in this case, of course, the supply of both illuminants is in the hands of one Company.

Municipal Depreciation Funds.

The question of depreciation funds in connection with municipally owned electricity and tramway undertakings is attracting a good deal of attention, and is likely to receive more as time goes on. In most cases, the tendency of corporations is to underrate the amount which should be set aside for wear and tear; and where there is any depreciation fund at all, it is as a rule inadequate. Even where an apparently adequate reserve fund does exist, corporations do not always rise superior to the temptation to raid it for some temporary purpose or to avoid an increase in the rates. The main difficulty is, however, to persuade municipal authorities that their tramways and electricity works are wearing out far faster than their cost is being paid off by means of the sinking funds, and that very serious difficulty will arise in the not distant future when money will be required to renew plant which has become useless. At Plymouth, the Gas Company have taken steps to impress the knowledge of this fact upon the Corporation. Two or three years ago, the Municipal Accountant and Borough Surveyor presented reports in which the gravity of the outlook in regard to the various undertakings of the Corporation was set out in unmistakable terms; but nothing has since been done to improve the position. The Corporation, floundering in a financial morass, have not been able to accumulate anything towards the large sum already needed for relaying part of the tramway track, or to make adequate provision for the rapid depreciation of the whole undertaking. In view of this fact, Messrs. Shelly and Johns, the Solicitors to the Gas Company, have written to the

Town Clerk stating that unless the formation of a reserve fund for the tramway undertaking is commenced at the earliest possible moment, the Company will feel it their duty to oppose any application for further borrowing powers by the Corporation for the use of the tramways. What effect this warning will have, remains to be seen. It will probably produce more result than the report of the officials, who can only indicate the road the Corporation should go, and have no means of compelling the members to travel in it.

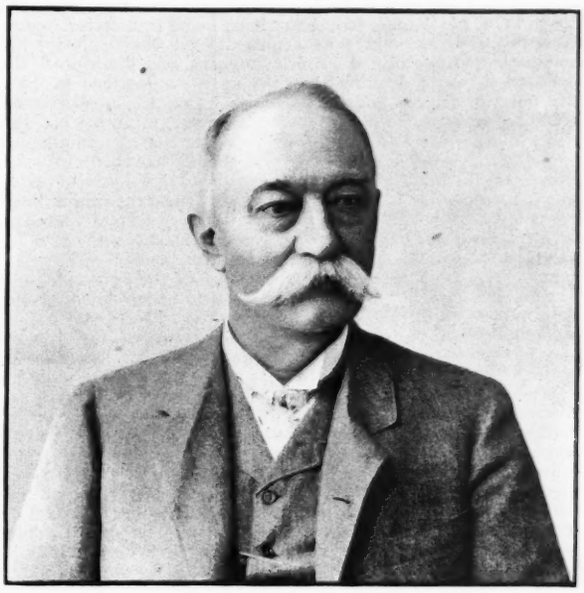
The Lighting and Watching Act.

Part III. of the Annual Local Taxation Returns (England and Wales) contains the accounts of Inspectors and Committees appointed under section 53 of the Local Government Act, 1894, under the Lighting and Watching Act, 1833. It appears that at the commencement of the year ending March 31 last there were 25 parishes in which lighting inspectors were still appointed under the Act; and there were also five joint committees appointed to exercise the powers of lighting inspectors in areas comprised in more than one rural parish. In addition to this, rates were raised under the Act for 800 parish councils and eight parish meetings. In the case of more than half of the councils the rate amounted to 3d. or under in the pound; but in five instances it was more than 9d. The distinction of paying the highest rate—1s. in the pound—was enjoyed by the inhabitants of Sandy (Beds.). The rates levied for the eight parish meetings were more modest, ranging from 1d. to 4½d. in the pound. In the parishes in which the Act was administered by inspectors and committees (other than parish councils), the lighting rates fixed during the year varied from 2d. to 9d. in the pound. The lowest rate was made by the East Tisbury and Wardour Committee; the top position being shared by four places—Crawley, Rayleigh, Upton-on-Severn, and Easingwold. The total receipts during the year of the inspectors and committees amounted to £3501, of which £3301 was from rates; while the expenditure was £3444. These authorities, it may be pointed out, have no authority to borrow money. In addition to the outlay on lighting, there are several instances in which expenditure on fire-engines and other appliances and fire-brigades is included. Adding to the above totals the sums received and paid under the Act during the year by parish councils and parish meetings, the total rates raised amounted to £65,373, and the total receipts (including rates) to £66,522; while the expenditure was £65,467, excluding the expenditure out of loans, which was £811.

The Incomes of Gas-Works.

Like ordinary individuals, gas and water works are compelled to submit to the inquisitiveness of the income-tax officials; and the forty-seventh report of the Commissioners of His Majesty's Inland Revenue contains some figures worth noting in regard to the results of these investigations. It appears that the gross income assessed in respect of gas-works in the United Kingdom (which is based on the profits of the preceding year) showed an increase in 1902-3 as compared with 1893-4 of £698,560, or 14·6 per cent. Compared with 1901-2, however, there was a decrease of £429,568, or 7·3 per cent. This is not the first time during the period named that there has been a drop in the gross income, as the following figures will show. In 1893-4, the amount was £4,770,885; 1894-5, £5,076,848; 1895-6, £5,959,432; 1896-7, £5,529,456; 1897-8, £5,582,771; 1898-9, £5,636,205; 1899-1900, £6,053,433; 1900-1, £6,361,750; 1901-2, £5,899,013; and 1902-3, £5,469,445. The returns for the last year named include 1524 works, 81 of which belonged to persons, 38 to firms, 1138 to public companies, and 267 to local authorities. The total incomes of the undertakings controlled by persons and firms were £11,782 and £12,151 respectively; while the companies secured £3,694,161, and the authorities £1,751,351. Of the sum placed to the credit of the companies, no less than £1,470,631 was made by ten concerns included under the heading "Metropolis;" there being also two works owned by persons which came within the same category, and returned a profit of £901. In England 198 of the gas-works included in the return are administered by local authorities, in Scotland 54, and in Ireland 15; the numbers of public companies being 902, 170, and 66 respectively. There are some other interesting statistics to be gathered from the return, to which we may refer next week.

THE LATE MR. EDWARD DRORY.



By the death of Mr. Edward Drory, the gas-engineering profession has lost one of its leaders, and the Imperial Continental Gas Association one of its faithful and brilliant officers. Some of the outstanding features of the life of Mr. Drory—personal and professional—were delineated in the "JOURNAL" last week just as our feelings ran upon receiving the painful intelligence that he had passed away. What was then written showed our appreciation of both the man and his work; and knowing much of both—he was in frequent communication with the "JOURNAL," his contributions to its pages were most valuable, and his welcome was ever ready in Berlin—we are able to say that the higher the tribute penned, the nearer to truth and to adequate recognition. But the sorrowful intelligence did not reach us in time last week to do full justice to the career of Mr. Drory; and therefore we supplement what was then published by a few additional facts, in bringing together which we have received the friendly assistance of Mr. R. W. Wilson, the Secretary of the Imperial Continental Gas Association.

Mr. Edward Drory was born in the year 1844; and, curious to remark, upon one of the works of the Imperial Continental Gas Association. Therefore to say that his connection with gas and with the Association was a lifelong one, is perfectly true. He was born in a gas-works, and spent his whole working life in the service of gas manufacture and supply. To few men is it given to be born into their future work, and to die in the midst of it, crowned with greater success than he, of whom we now write, achieved. He was the son of Mr. Leonard Drory, who, in conjunction with his brother, Mr. George William Drory, was the builder of the first gas-works ever erected on the European Continent. Those were the Hanover works of the Imperial Continental Gas Association; and the year of their construction was 1826. A year later George (whose name will be ever remembered as the first Chief Engineer and representative of the Association on the Continent) went to Berlin to construct for the Association their first works there; the father of Edward remaining behind for some time as the Manager of those at Hanover. He subsequently took charge of the Berlin works, on which the subject of our memoir was born. Edward was one of a numerous family; and he, like so many of his brothers, entered at an early age into the service of the Association. The family was a large one—fourteen in all, and twelve of them boys, no less than eight of whom became officers of the Association, so that in the records of the latter the name of Drory is indelibly written. Of these eight, the son Leonard George went to Berlin, William to Frankfort (where he is even to-day, having, as we recently announced in the "JOURNAL," seen his jubilee in the service), Harry to Berlin, Frederick to Antwerp, Alfred is now in charge of the Association's meter and stove factory at Mariendorf, James is at Aix-la-Chapelle, and Louis and the subject of this sketch also received appointments. All these brothers eventually became Managers of works; but of the eight there only to-day remain William, James, and Alfred. William and the late Leonard and Frederick out of the large family are the only ones having sons to perpetuate the name of the family, which has been so intimately linked with that of the "I.C.G.A.," as the great undertaking is known and spoken of for brevity among the officials. One of the Directors of the Association, writing last week to Mr. Wilson, expressed what is the general feeling when he said: "It is very sad to lose one after another of the Drorys. The 'I.C.G.A.' will never seem the same without them."

However, Edward had reached the age of 19 when he entered the service of the Association. He was first appointed in the year 1862 to Frankfort-on-the-Main where Mr. William Drory, the *doyen* of the Engineers of the Association, was even then Manager. He did not, however, remain there long, being transferred a year later to Bordeaux, where he acquired what was really a marvellous knowledge of the French language and literature. He believed it was a healthy thing to have occupations to turn the mind in leisure hours from those which are uppermost in one's thoughts, and which enter most largely into one's life. It was while he was located, too, in Bordeaux that he commenced to study the bee. The gas-works, it should be remarked, were situated in the luxuriant quarter of the town; and the opportunity was a good one for what many people will consider a very strange study for a gas man. But Mr. Edward Drory did not regard it as strange or incompatible with gas engineering and management. Bee life for him was a fascinating study; and he became one of the most celebrated masters of the subject in the world. He kept his own hives, and studied their inmates and their habits; and the results of his study have been recounted in his writings. At the present time on the Mariendorf Gas-Works, may be seen two ranges of hives constructed on Mr. Drory's own principle, and well stocked with bees.

When the contract for the gas supply of Bordeaux expired, the Association, it will be remembered by those interested in the matter, were unable to renew the concession. This was in 1876; and thus it came about that Mr. Drory was transferred to Vienna —first, as Manager of the small works at Tabor, and later on of the chief works, at Erdberg. In Vienna, his energies were not only devoted to the management of gas works, but he also took charge of the Association's retort and fire-clay factory, which he brought to a great state of efficiency. This was due entirely to his unswerving principle to know all about everything to which he put his hand, as seen in the unexcelled personal work that he brought to bear on the inclined-retort system before he erected a single permanent installation. He gained by his researches a wonderful knowledge of fire-clay and retorts; and, through this, the Association turned out for themselves goods in this line which, it is said, are unrivalled for general excellence and durability. This particular work no doubt materially aided him in designing the special blocks, constituting the main parts of the settings in his inclined-retort work. It was at Vienna, too, where he first took up the investigation of the inclined-retort system; and readers who wish to know more about what he then did should read the articles—especially the one on "Retort-Houses for Inclined Settings and their Development"—which appeared in 1902, and follow them up by the description of his work at Mariendorf published in February and March this year. No one who has had the pleasure of visiting these works can deny that he brought the system, as worked there, to a remarkable state of perfection. The secret of his great success as an engineer was the spirit of close inquiry which animated him in all things.

To pass onward. Nothing was more natural than that, on the death in 1896 of his brother Leonard, who was in charge of the works at Berlin, Edward Drory should have been selected to succeed him. He had proved himself worthy of the greatest confidence and responsibility the Directors could confer upon him. The Association's works in the city were then the Gitschinerstrasse, the Schöneberg, and the Holzmarktstrasse; and directly he entered upon his new charge, he set about remodelling the first-named, which were the principal of the three. In a short period—considering the heavy character of the work undertaken —the plant was completely reorganized and modernized. As a matter of historical interest, it may be mentioned that, on the Gitschinerstrasse works, still stands the original retort-house built by the uncle of our deceased friend in the latter part of the twenties. It contains horizontal retorts, but is not now used, as all the gas is now being made in inclined retorts. Then we come to the time when the increased consumption of gas not only for lighting, but for cooking and industrial purposes, necessitated the construction of new works. The Mariendorf works were the result; and Edward Drory was their Engineer. The character of the works is so well known to our readers that we may stay our pen. They stand as a monument to one who was a leader, and to the keen sense of duty which moved him—duty to himself, to those he served, and to the profession of which he was proud. In addition to his work for the Imperial Continental Gas Association, he acted as Consulting Engineer for Trieste, Hamburg, and many other places; and just before he died, he had been asked to occupy a similar position for one of the Breslau authorities.

We need not add anything to the estimate made last week of his personal qualities. He was magnetic, and drew to himself friends wherever he went; and his influence was great. He leaves a widow, but no family—his only child, a daughter of great intellectual promise, dying at the age of 16.

Mr. Drory was laid to his last rest on Wednesday in the family vault at Berlin. It was a quiet ceremony; but there were eloquent addresses by the clergy in the chapel, and one at the side of the grave by Mr. L. Körting, the Engineer of the Imperial Continental Gas Association at Hanover, on behalf of the German Association of Gas Engineers. The absence of great ceremony befitted the man; the eloquence his deeds. There was an almost innumerable number of wreaths testifying to a widespread grief. It was noticed that among the senders were the Directors of the Imperial Continental Gas Association; the Secretary and London staff; representatives of the cities of Berlin, Hamburg, and Rixdorf; business friends, among them the Allgemeine Electricitäts Gesellschaft and the Berlin-Anhaltische, who are now building the largest gasholder on the Continent at Mariendorf, and the second to be put up there. There was no formal procession; but the Association's workmen lined the path from the cemetery gates to the grave. There must have been quite 1000 persons present; and among them were observed Messrs. Schimming and Fuerst of the Berlin Corporation Gas-Works, Mr. Kempner, of Dessau, Mr. Delbrueck, the representative of the Association in Berlin, Mr. Andresen (the Assistant Secretary in London, who was sent over to represent the Board and the London staff, the Secretary being unable to attend owing to illness), Messrs. William, James, and Alfred Drory (brothers of the deceased), Mr. E. Körting, the Chief Assistant at Berlin, and all the assistants.

Mr. Edward Drory's reputation had spread throughout the gas profession of the world; but those who knew him best will most keenly feel his loss. With the widow and relatives, there is widespread and the deepest sympathy.

PERSONAL.

Mr. J. Ronald Mackenzie, who for the past two years has been Manager of the Urban Council gas-works at New Mills, was last week appointed to a similar position at the Marple Gas-Works. There were forty applicants for the post.

An interesting ceremony took place in connection with the recent meeting of the Ryde (Isle of Wight) Gas Company, when the retiring Collector, Mr. H. H. Perkins, was presented with a valuable keyless half-hunter gold watch, in recognition of his seventeen years' faithful services.

OBITUARY.

The death took place suddenly, last Friday week, at his residence at Langley Mill, of Mr. T. Newsum Turner, the Chairman of the Langley Mill and Heanor Gas Company. Deceased, who was 48 years of age, also held many other important positions.

The death occurred last Saturday week of Mr. Henry Ingham, who was for some years Secretary to the Settle Gas Company. Deceased, who was only in his 36th year, had a fall from his bicycle some months ago; and though he did not for a time feel much the worse for it, blood poisoning ultimately set in.

Mr. George Heaton, who died last Saturday week, aged 72 years, for many years devoted himself to the public life of Birmingham and district; and at the time the Corporation took over the gas and water undertakings, he was prominently concerned in the negotiations on behalf of the Water Company.

On Sunday week, the death occurred in Edinburgh of Sir James Steel, ex-Lord Provost of the city. The deceased was born in 1830; and nearly forty years ago he began business in Edinburgh as a builder. In 1872 he entered the Council, and in 1900 was elected Lord Provost. He held this office at the time of the opening of the new Granton Gas-Works in the early part of last year, but unfortunately was not well enough to take any part in the ceremony. He received his baronetcy on the occasion of the King's first visit to Scotland after his coronation.

Artistic Gas-Fittings.—The "Builder" suggests that, when adjudging the competitions for "artistic" fittings at the Earl's Court Gas Exhibition, the judges appointed should be men who could command respect as artists.

North of England Gas Managers' Association.—The half-yearly meeting of this Association will be held on Saturday, Oct. 1, at the George Hotel, Harrogate, under the presidency of Mr. E. E. J. Anderson, who will deliver his address. By the kind hospitality of the Chairman and Directors of the Harrogate Gas Company, luncheon will be provided; and afterwards there will be a local drive. The gas-works will be open for inspection by members on Friday evening and Saturday morning; and by the courtesy of the Corporation, the Royal Baths, Kursaal, and Pump Room may also be visited.

Masonic.—A meeting of the founders of the "Northern Star" Lodge, No. 3053, was held last Tuesday at the Midland Hotel, Manchester, when it was reported that the date fixed for the consecration of the lodge by Lord Stanley, P.G.M. for Lancashire, was Friday, Nov. 4. The suggested list of officers for the first year includes the following gas engineers: For W.M., Bro. John Niven, of Clayton; Acting I.P.M., Bro. W. Severs, of Wilmslow; S.W., Bro. R. G. Shadbolt, of Grantham; J.W., Bro. S. R. Ogden, of Blackburn; Treasurer, Bro. Harrison Veevers; Secretary, Bro. S. S. Mellor; S.D., Bro. W. Prince; J.D., Bro. W. Taylor; I.G., Bro. J. S. Naylor; D.C., Bro. Thomas Duxbury; Organist, Bro. J. Gibson; Stewards, Bros. Surtees, Pennington, Anderson, and Robinson. Bro. J. W. Broadhead, Prov. G. Steward of Yorkshire, has been asked to act as Installing Master, assisted by Bros. Thomas Cash and James R. Lee.

THE PROVAN GAS-WORKS OF THE GLASGOW CORPORATION.

FIRST ARTICLE.

[With this issue we publish, as Plates, the Ground Plan of the Works, and the first two of a Series of Drawings dealing with the Retort-House.]

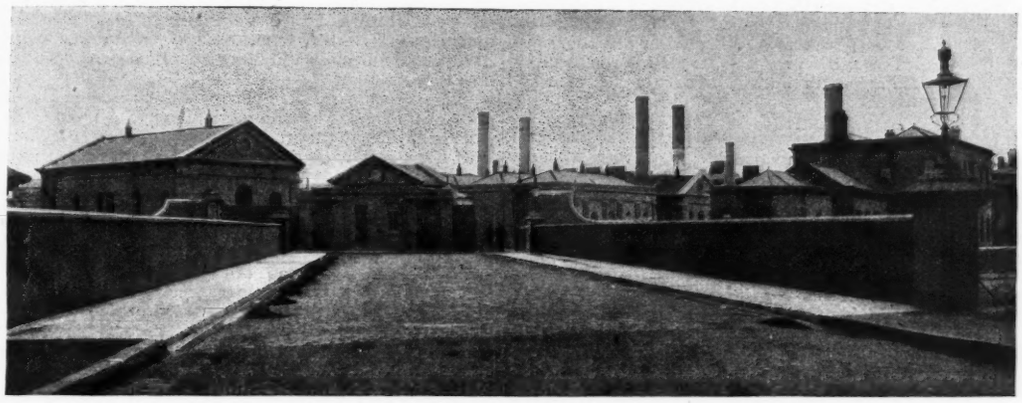


FIG. 1.—VIEW OF THE MAIN ENTRANCE TO THE PROVAN WORKS.

THE first section of the Provan Gas-Works of the Glasgow Corporation is approaching completion; and to-morrow will see the formal inauguration. Large, magnificent, complete, the works are typical of the breadth of thought and view, the talent and ingenuity of their designer—William Foulis, who was laid to his final rest rather more than twelve months ago. An engineer born—not made—was the founder of these Provan works; and when he plotted out the site of erratic level, and entered with his habitual zest into overcoming the errors of Nature in giving form to a tract of land to be utilized for gas-works purposes, and laid down his plans, he plotted and planned what was to be the crowning work of his life, and the best of monuments to his ability as a gas engineer. The works materialize his views of what an extensive gas plant on such a site should be. He passed away twelve months or so ago, while the works were yet in course of construction; to-day a large part of the first section is in operation. Though Mr. Foulis was not spared to see the completion of his ideals, the scheme has been faithfully continued by Mr. Alexander Wilson on the lines proposed by his eminent predecessor and former chief. Naturally, there have been many blanks to fill in; but the scheme had only one originator. There are, too, little improvements to be made here and there, as is only natural and unavoidable in setting to work an extensive plant of this kind, capable as the first section alone will be, of producing 12 million cubic feet of gas per day; but these improvements are merely small additions to the great body of the scheme. In all details, the plant may not be considered perfect by every engineer. To expect that it would be in all particulars, though designed by Mr. Foulis, would be expecting too much. Mr. Foulis was human. He had his fancies; other engineers have theirs. But taken as a whole—from inception to finish—the works at Provan can only be described as a grand engineering achievement, worthy of the man who was instrumental in placing them there.

THE NECESSITY FOR THE NEW WORKS.

This description of the new Provan Gas-Works is to be an extended one; and they richly deserve something more than

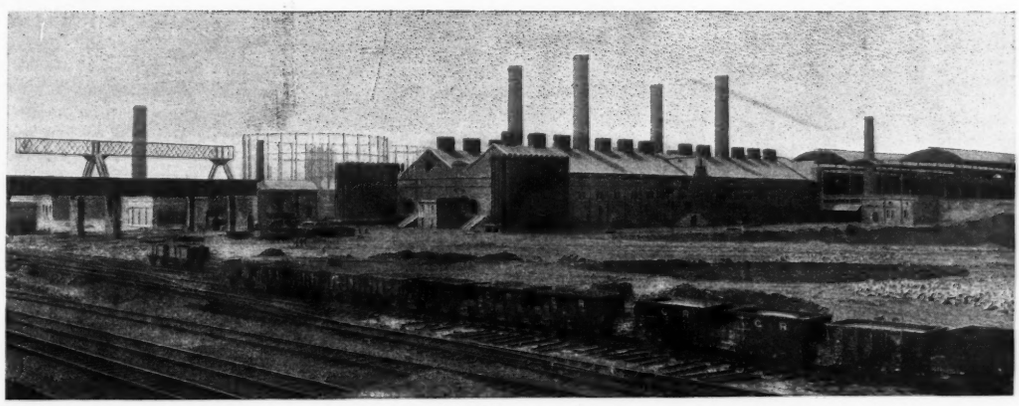


FIG. 2.—GENERAL VIEW OF THE WORKS FROM THE NORTH END.

general treatment. That we are in a position to deal very fully with them—to trace, as it were, the final views, founded on a life-long engineering experience, of Mr. Foulis, as illustrated by the works—is due to the courtesy of Mr. Wilson, and to the information, plans, and photographs placed at our disposal by him and his assistant (Mr. James Lowe, Assoc.M.Inst.C.E.). To make the story complete, the description must be prefaced by a short statement to show the necessity, which the recurring years have made more and more pronounced, for the Provan scheme. The figures as to the consumption of gas which we have before us go back to 1857; and they speak of an unbroken progress. Great as was the increase in consumption in the decades immediately succeeding 1857, it is small as compared with what has followed since 1887. Between 1857 and close on to 1880, the price of gas only varied between 4s. 7d. and 3s. 10d.; but by 1887 it was down to 3s., and by 1897 to 2s. 2d., with the result that between those two years—1887 and 1897—the consumption increased from 2,596,470,000 cubic feet to 5,167,118,000 cubic feet. These are big figures, and represent a doubling of consumption. But 1901 saw that nearly another thousand millions of cubic feet had been added to the latter figure; and in the last financial year, there was registered a consumption of 6,641,891,000 cubic feet. Who will marvel at this progress when it is mentioned that this is 20-candle gas at 2s. 1d. per 1000 cubic feet? This low price is due to several things, chief among which are the low working expenses of the department, the proximity of the works to their coal and cannel supply, and the fact that the Corporation do not grasp for exorbitant sums out of the gas consumers to aid the rates.

However, the time came—as come it must with sites and works designed many years ago and comtemplating a far smaller business and of a less expansive order—when the old works showed their inability to continue much longer to bear, unaided, the strain upon them, and when they could offer no further room for plant reinforcement. Thus, it came about that in 1898—the year succeeding the one which saw the completion of the doubling of the output in a decade—following upon the advice of Mr. Foulis, the question of obtaining a site for new works was carefully considered. This was a cause of great anxiety to Mr. Foulis, who

(we remember hearing say) scoured the country round in his quest for a suitable site. His principal difficulty in the selection arose from the necessity of getting a piece of ground of sufficient extent entirely free from coal workings. However, eventually his choice fell upon the Provan site, situated on the eastern boundary of the municipal area, and which included the lands of Easter Blochairn and a portion of Blackhill and Germiston Estates. Then, in the session of 1899, a Bill was introduced into Parliament to empower the Corporation to purchase the lands, and to erect gas-works thereon. The Act was obtained in August, 1899; and, so well advanced were the preparations for the works, that a commencement was made with them in January of the following year.

Characteristics and Influence of the Site at Provan.

The site was not altogether one that Mr. Foulis would have preferred; but it was the best that was to be had for gas-works of the extent he had in view. It had a gross area of 131 acres; and he saw his way to utilizing it for four sections of buildings and plant, forming independent works, and each capable of manufacturing 12 million cubic feet of gas per day, or a total of 48 millions. Among other benefits that presented themselves, the site is conveniently situated for both the North British and Caledonian railway lines, and the Monkland Canal also forms a border to the works. This variety of channels for supplies and the removal of material naturally appealed to the commercial instincts of Mr. Foulis. But the great divergence in the levels of the land—with a slope from west to east—was the greatest drawback to the making of the site an ideal one for gas-works purposes; but these irregularities of level only sharpened the wits of the Engineer to make them subserve his plans. Therefore, in considering the character of the plant and works generally, there must be remembrance of the fact that the site has had a fundamental influence on them. Much excavation and filling work has had to be done; and, naturally, this and the other peculiarities of the site have had their effect on the capital outlay on the works. But present outlay, the far-seeing engineer saw, promised a future saving on working costs, through the facility which the variation of level will afford in dealing with the incoming and outgoing material. The coal, lime, &c., will be brought in at the high level; and the coke and other materials will be sent away at the low level.

From the general plan of the retort-house and coal-stores, some idea of the inclined and undulating character of the site will be realized. Right through the coal-stores and the first pair of retort-houses, it is seen that there was a gradual sloping, which meant considerable filling up in both the stores and the retort-houses. In both cases, too, in order to save brickwork, arches were used extensively in the side walls of the building. Some idea of the original contour of the ground here will be given when it is mentioned that the piers of the arches range from 7 ft. to 15 ft. in depth in the case of the retort-house, and that the *elevated* railway in the coal-store enters it at the ground-level at one end. In fact, the coal descends as it were in stages from the incoming railway sidings until it finally reaches the retorts. Besides this great variation of level, the acquisition of the site by the Corporation for the purposes of gas-works carried with it obligations in connection with the provision of bridges and roads. The main entrance to the works, for example, is along a road—extending from what is known as the Cumbernauld Road to the boundary

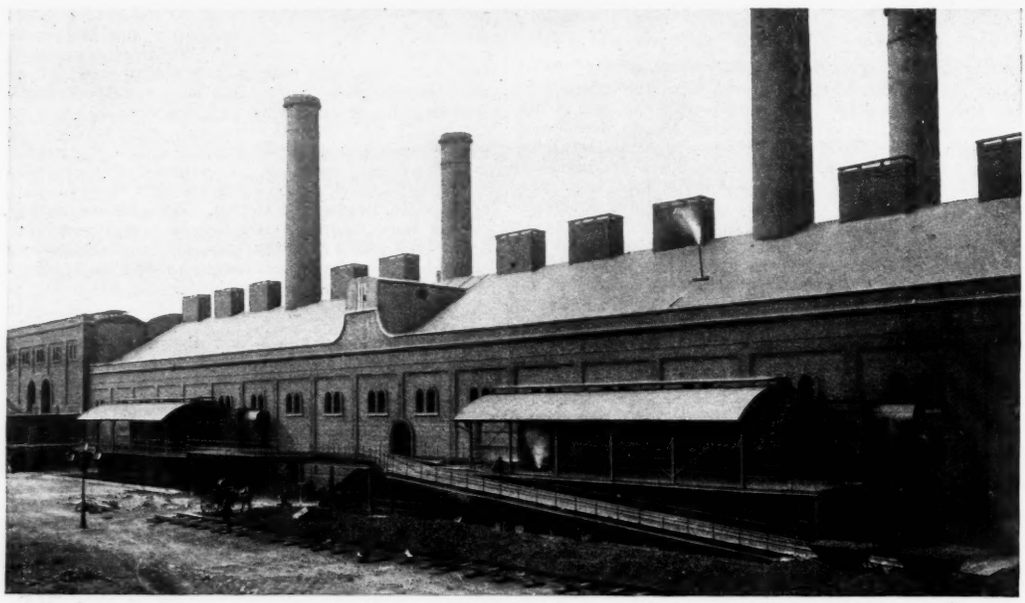


Fig. 3.—View of the Retort-House and Outside Producers. The Coal-Store is seen on the Left-Hand Side of the Picture.

of the site—rather more than ½ mile long and 60 feet broad, which had to be constructed by the Gas Department, and, in addition to it, three bridges had also to be built—the first one over the Monkland Canal leading to the entrance gate, the second and third are over the Caledonian Railway—one of them being constructed especially for the use of the iron and steel works adjoining. The coming of the gas-works has been an advantage to them in this respect, as no road existed there before. These bridges, which were all designed in the Engineer's office, of course, meant the expenditure of a great deal of money. It will thus be seen that the difficulties of the site were manifold, but, Mr. Foulis proved, not insuperable, great though they were.

The Building Material.

We need not go into all the details of the beginning of the work at Provan to describe what now exists there; but it is always of some interest for one engineer to know something of the preparatory methods and requirements of a colleague, especially one of the high and refined ability of Mr. Foulis, and of such inflexible notions (when once formed) as to the fitness of method or material for any particular purpose. We need not speak further than has already been done of the enormous amount of heavy excavation and filling work required, nor say anything of the drainage system adopted. These are matters that are special to every separate site. Leaving them, the building work follows; and this brings us to the question of the material used—concrete, mortar, bricks, and puddle.

In the first place, the concrete used in various parts of the work was composed of three parts brick or stone, or old slag, broken to a size capable of passing through a 2-inch ring, two parts of clean river or pit sand, and one part of portland cement. Turning over twice dry and twice after water was added was the mixing, on a platform, that these materials obtained. The concrete was put down in layers 6 inches thick, and was well beaten with wooden beaters. The junctions were left rough, and were carefully cleaned and watered before fresh concrete was added. The window sills, bearing-blocks, copes, &c., are composed of three parts of stone, broken to a size to pass through a ¾-inch ring, one part of clean sand, and one part of portland cement smoothed on surface.

Then the mortar used was composed of ground Arden lime of best quality, and clean sharp sand in equal proportions; while the portland cement mortar consisted of one part of best portland cement, and two parts of clean pit sand—in both cases the cement and sand were mixed dry, and worked up to a proper consistency with water in a mortar-mill. The portland cement used for all parts of the contract had to comply with the following specification: "(*a*) Not more than 10 per cent. shall be retained on a sieve of 5800 meshes per square inch, made of No. 35 B.W.G. wire. (*b*) None shall be retained in a sieve of 625 meshes per square inch, made of No. 37 B.W.G. wire. (*c*) It shall have a specific gravity of not less than 3·1, and shall weigh 87 lbs. per cubic foot. (*d*) It shall not set in less than 30 minutes. (*e*) Briquettes made of neat cement, gauged with the least possible quantity of water, and allowed to set one day in air and six in water, shall not break at less than 350 lbs. per square inch of section tensile stress.

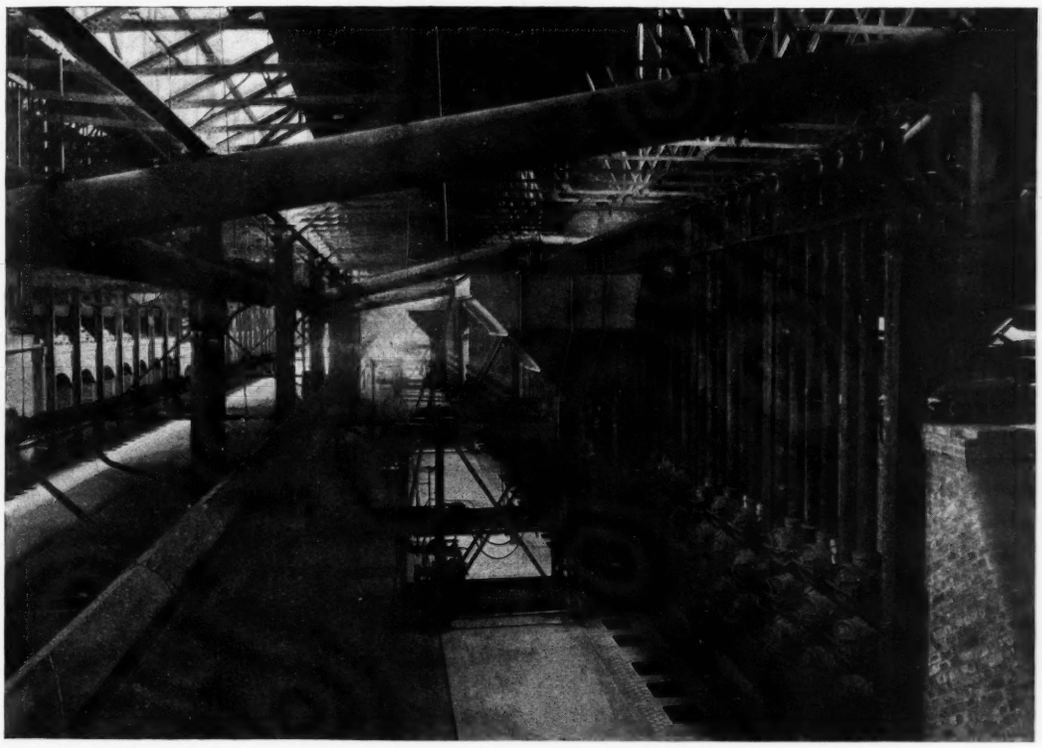


FIG. 4.—GENERAL VIEW ON CENTRAL STAGE, WITH ARROL-FOULIS CHARGING-MACHINE.

(*f*) Gauged with three times by weight of clean sand, and allowed to set 24 hours in air and 27 days in water, shall break at not less than 220 lbs. per square inch."

Now as to the brickwork. All the bricks required for the buildings—and as will be seen they are extensive ones—were made from the clay excavated from the site. The Corporation put down a brick-making plant and kilns and the necessary buildings for the production of machine-made bricks; and these were leased to the contractor. The plant consisted of two brick-making machines, three pan-mills for grinding up the clay, and three Hoffmann kilns, with, of course, a steam-engine, gearing, &c., to make up a complete plant, capable of turning out 25,000 bricks per day. The conditions attaching to the leasing of the plant are not of general interest; but it may be stated that the contractors had to pay the expenses of excavating the clay and making and burning the bricks, and the terms included the payment of a royalty per 1000 to the Corporation. Making the bricks on the site possessed the advantage of enabling constant and thorough inspection. No bricks were allowed to be used, except those of best quality; well pressed and shaped, and hard burned. All through the buildings on the works, the same conditions applied as to the laying of the bricks; and Mr. Foulis was not the man

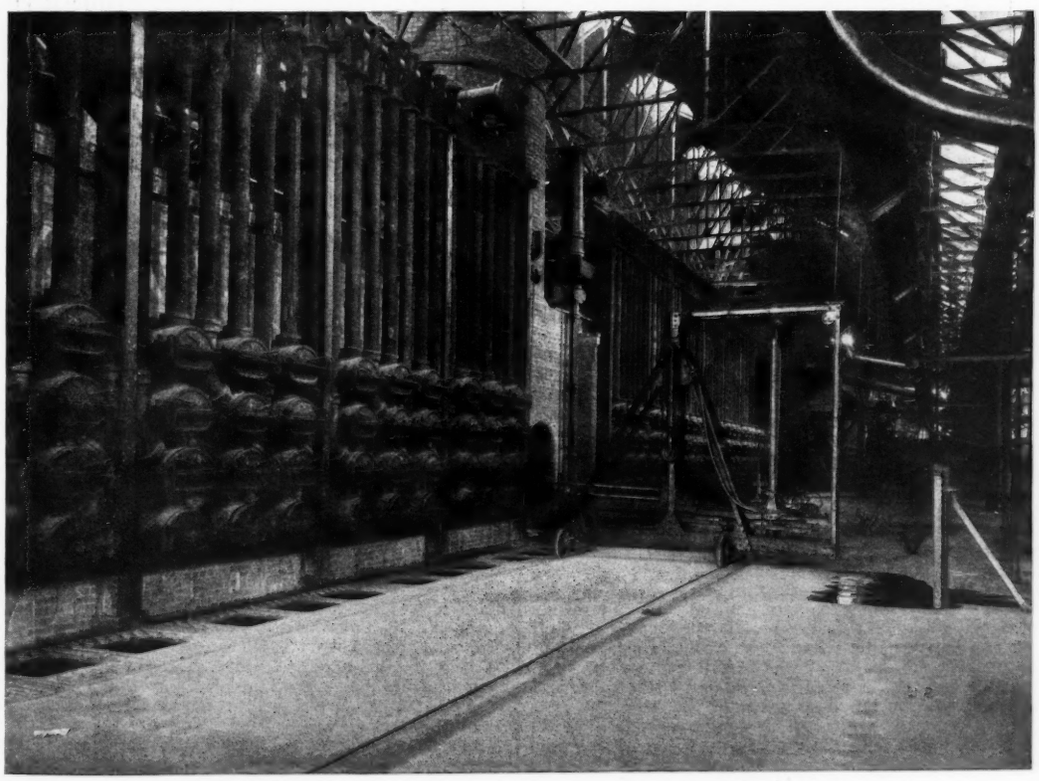


FIG. 5.—ONE OF THE STAGE-FLOORS, WITH ARROL-FOULIS DRAWING-MACHINE.

to lay down conditions that he did not intend to have carried out. The bricks were thoroughly well soaked with water before being laid, each course was well grouted with mortar, and all joints were neatly pointed and struck on exposed surfaces. No half bricks were allowed, except as closers; and at least every fourth course of brickwork is a course of headers. Each course of bricks was grouted separately. In walls 3 feet thick and upwards, the grout was poured on the wall, and the bricks floated into it—the grout being well worked into the joints so as to fill every crevice; and no joint is more than ¼ inch thick. Practically all brickwork below the ground level is built with portland cement mortar; and all walls less than 3 feet thick above the ground level are built with machine-made pressed bricks.

In regard to the puddle used, the requirements were that it

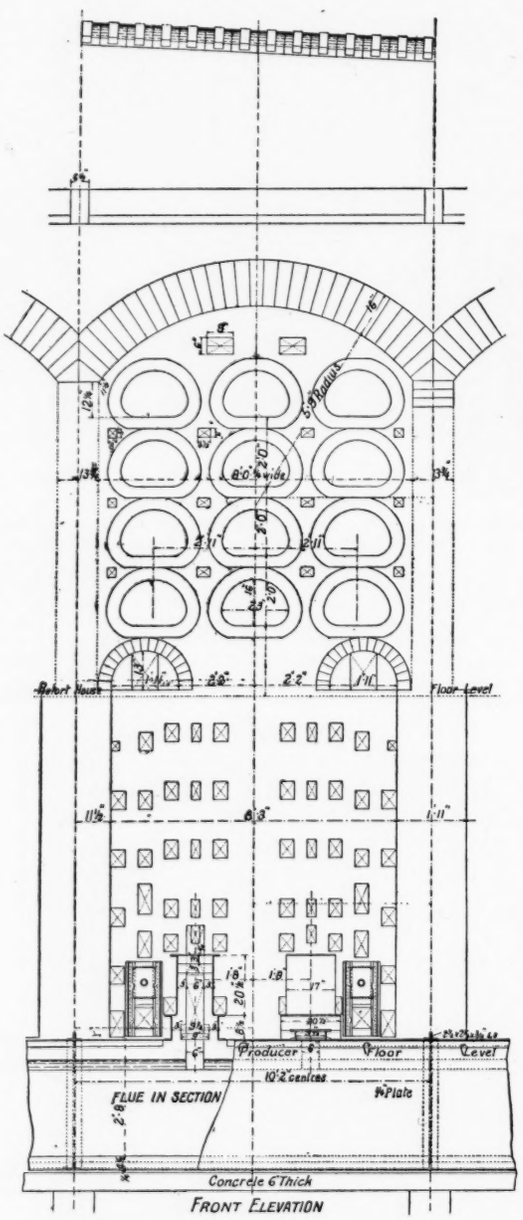


FIG. 6.—DETAILS OF RETORT-SETTINGS.

should consist of good clay, free from sand, properly tempered and milled, and be put in layers not exceeding 6 inches thick. Each layer had to be thoroughly worked into the one immediately below it, so as to reduce the whole to a uniform consistency, and all joints, seams, or hollows destroyed. Layers that had stood exposed for any length of time had to be carefully cleaned and watered before an additional layer was added.

This completes all the necessary preliminary statement and explanation, and enables the description of the works as now existing to be proceeded with. The course proposed to be adopted is to deal first with the retort-houses and coal-stores and all appertaining to them, and then to follow the plant, as nearly as convenience will permit, in its proper order to the gasholders.

THE RETORT-HOUSE.

From the main entrance gates, as will be seen by the ground plan, there is a good broad road bordered by ranges of buildings on either side, which buildings will fall for notice in later articles. Standing facing the visitor are the twin retort-houses, each designed for the manufacture of 6 million cubic feet of gas; and thus constituting the producing capacity of the first section. Beyond their size, their external architectural features are not many—their designer belonging to the school of engineers who believe thoroughly in plain but substantial structure in all parts of the works devoted exclusively to the hard, grimy work of manufacture. The retort-houses and the coal-stores make an imposing, continuous length of buildings 798 feet long. But we must first

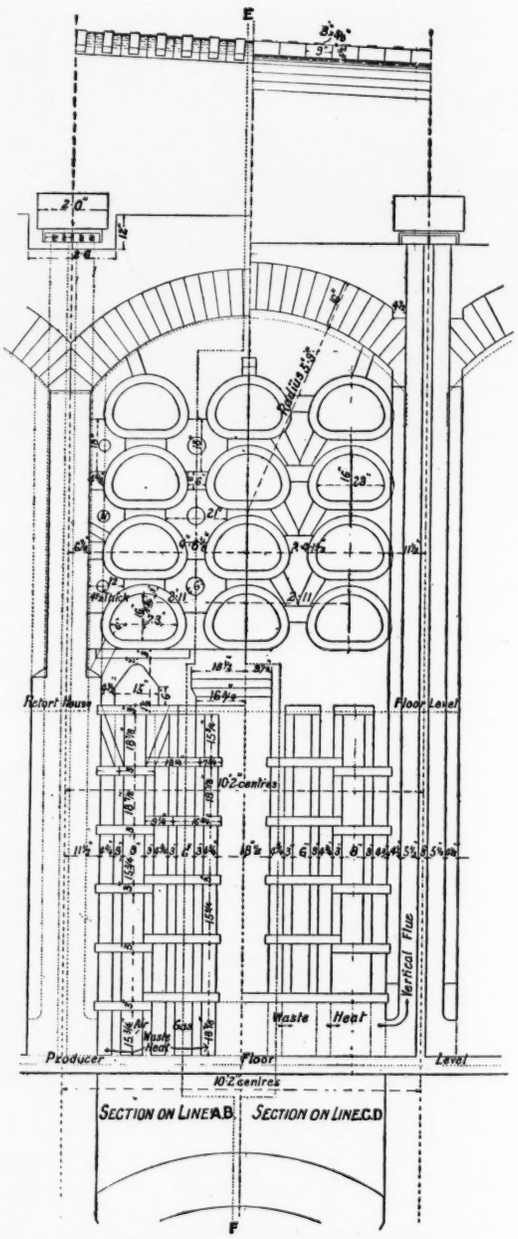


FIG. 7.—DETAILS OF RETORT-SETTINGS.

confine ourselves to the pair of retort-houses. These are 390 feet long; and measured from the face of the side walls 160 ft. 9 in. wide—that is to say, the two houses have no partition, and inside division is only marked by the high columns which support the roofwork. Therefore it may be taken that the inside width of each house is about 78 feet. From the producer-floor level to the seats of the roof principals, the height is 39 feet, or 29 feet from the stage-floors. From the shoes of the principals to the ridge of the roofs is 28 ft. 4 in. It may be well to mention here that each house has a roof of single span.

As to the construction of these houses, the side and end walls are built on a continuous concrete foundation, and, as already stated, partly on arches. The side walls are 2 ft. 9 in. thick up to within a few inches of the retort-house floor, and 2 ft. 4½ in. above

that level. The east gable wall is 2 ft. 4½ in. thick to the level of the seat of the principals, and 2 ft. thick above. The walls are panelled, and have projecting courses at the top. A 9-inch parapet wall is built on top of the side walls, with substantial copings. It is observed that there has been a liberal provision of entrances to both the producer and stage floors, with, to the latter, double and single flights of stone steps. In each panel of the walls, there are also double mullioned windows, 7 ft. 2 in. wide and 6 feet high. It will be gathered from this, and inspection of the houses (or plans and photographs) conveys it even more clearly, that the treatment of access, ventilation, and light has been of a generous character.

In conjunction with the building work, notice must be taken of the provision made for the support of the roof work. In connection with the east gable wall, there is a pier 6 ft. long, and 2 ft. 9 in. thick for a height of 12 ft. above the retort-house floor level, and 2 ft. 4½ in. thick from that upwards, capped with a stone 18 inches thick, to support the huge central girder carrying the roofs. The bearing-stones in the side walls for the roof principals are 18 in. by 18 in. by 12 in. For the eight central roof columns concrete beds 9 ft. 6 in. square and 2 ft. 9 in. thick were laid; and from these to the level of the producer-floor (where required) brick piers 6 feet square are built, with stone piers 5 feet square above.

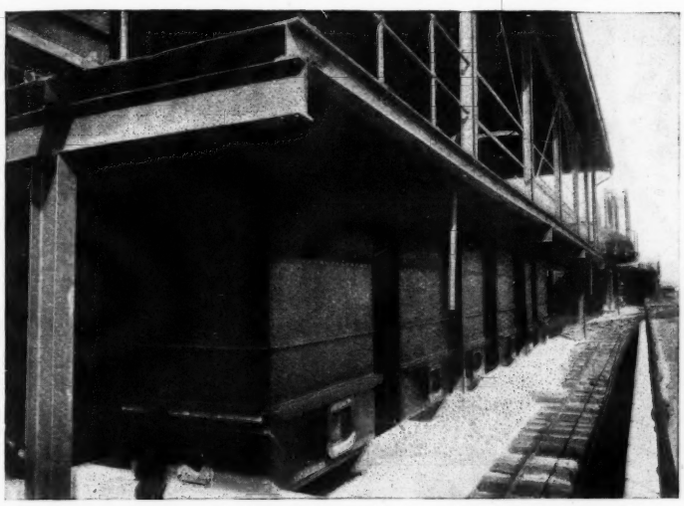


FIG. 9.—VIEW OF ONE OF THE GROUPS OF OUTSIDE PRODUCERS.

This brings us to the ironwork of the roof; and as one passes to the broad central stage-floor (formed by the two floors having no other division than the roof columns), the massiveness of the columns and the girder which they support at once attracts notice. The columns are 34 ft. 6 in. long by 2 ft. 6 in. diameter at the base, tapering to 24 inches diameter at the top; while the girder is 6 ft. 10 in. deep over all, and is made up in eight lengths bolted together by six 1¼ inch bolts, and to the tops of the columns by four 1½-inch bolts. In all, there are 55 principals in each roof, placed slightly more than 7 feet apart, and constructed of T bars, braced and trussed. Particulars of the construction of both girders and principals will be obtained from the drawings as published. The purlins are 2 in. by 2 in. by $\frac{5}{16}$ in. angles, placed 10½ in. centres. Diagonal wind-bracing bars, formed of 3½ in. by 3½ in. by $\frac{5}{16}$ in. angles, are fixed between the pairs of principals at the ends of the roofs and adjacent to the chimneys; and wind ties, 4 in. by $\frac{5}{8}$ in. flat bars, are bolted diagonally across the principals. A ridge T bar, 3 in. by 3 in. by $\frac{5}{8}$ in., is bolted between each pair of principals by two 3 in. by 3 in. by $\frac{5}{8}$ in. angle cleats and $\frac{7}{8}$ inch bolts; and a 3 in. by $\frac{5}{8}$ in. flat distance-bar is fixed to the bottom member of the principals in the same manner. In each roof, there are twelve ridge ventilators, 14 ft. long by 6 ft. wide and 12 ft. high, constructed of a framework of angle-iron, covered to a height of 9 feet with Quebec red pine, with louvre openings above. The valley ventilator is formed of corrugated sheet iron, supported from each alternate principal by angle-iron frames carrying four angle-bar purlins. The roofs are, of course, slated.

This will suffice as an outline of the structural features of the retort-houses themselves; but before proceeding to the retort-settings and auxiliary plant, the chimneys and stage-floors may be briefly described. The chimneys of the Provan works are a feature as one approaches the latter from the main road; there being, in connection with this first section alone, no less than ten. The two retort-houses account for four—two to each. The height of these from the retort-house floor level is 130 feet. They each rest on a bed of concrete 25 ft. by 20 ft. by 4 ft. 3 in. The base of the chimneys for a height of 26 feet above the producer-floor level is 15 ft. 6 in. square; and above this they are circular—the outside diameter on top of base being 14 ft. 4 in., and at the cope 13 ft. Between the joints every 5 feet in height, there is built in an iron ring 3½ inches broad and ¼ inch thick. Each chimney is lined with fire-brick 9 inches thick from top to bottom, built with ground fire-clay, three courses stretchers and one course headers alternately. The internal diameter of the fire-brick lining is 8 ft. 6 in.

Regarding the stage-floors, these are supported on cast-iron columns, steel girders, and joists; and some particulars of these may also be both interesting and useful. The foundations for the piers to carry the outer rows of columns of the retort-house floors are of concrete, 4 feet square and 15 inches thick. The brick piers above are 3 feet square; with stone 30 inches square and 15 inches thick on top to suit the base of the cast-iron columns. The foundations for the inner rows of piers will be referred to in connection with the retort-bench foundations. On each side of

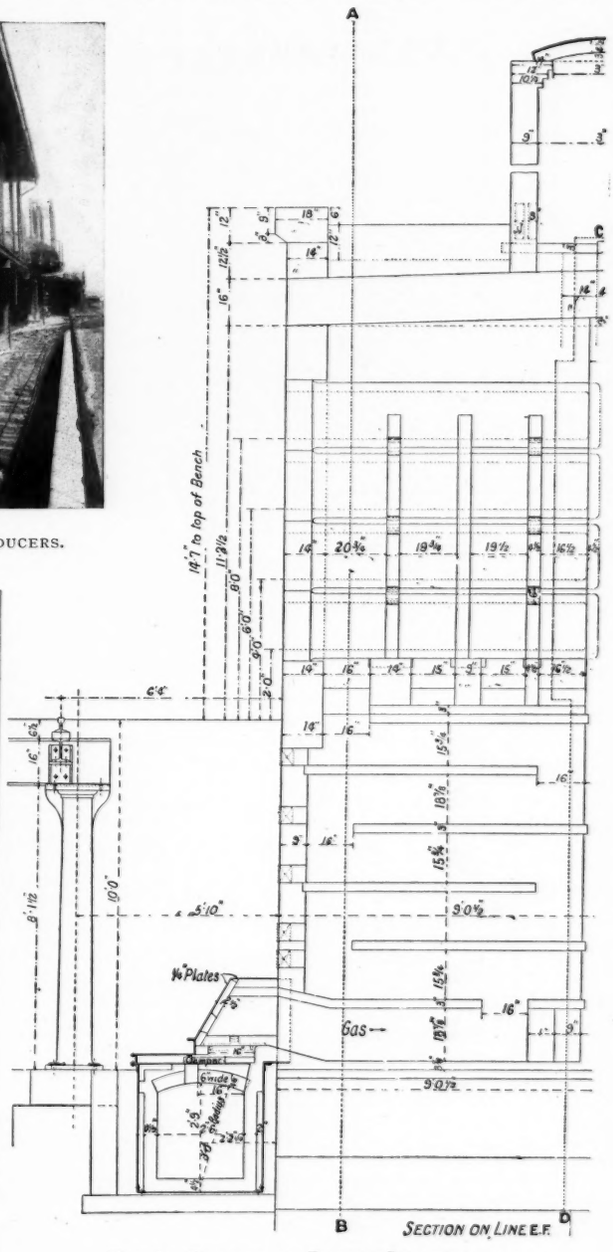


FIG. 8.—DETAILS OF RETORT-SETTINGS.

the retort-benches, there are two rows of cast-iron columns; the inner row consisting of 36 columns, or in all 144 for the two houses. These are 8 ft. 1½ in. long by 12 inches diameter at the base, tapering to 10 inches at the top. Variations, of course, are made in special positions. In the outer rows, there are 19 columns (6 ft. 8½ inches long); or, in all, 76 columns. The outer row of columns supports a line of compound girders 17 in. deep and 10 in. broad, formed of rolled steel joist, 16 inches deep and 6 inches broad, having plates 10 inches broad and ½ inch thick riveted top and bottom. These girders rest on piers at the east wall, and have a bearing of 9 inches on the 18-inch wall at the west end of the house. Across the top of these compound girders, and resting on the flange of the inner row of columns, are laid and bolted rolled steel joists, 16 inches deep by 6 inches

broad. Between these main cross joists are rolled steel joists, 8 in. deep by 6 in. broad. Subsidiary joists for supporting the floor plates and conveyors are also provided. The floors themselves are composed of 6-inch concrete reinforced by expanded metal. The space between the end of the cross joists and side walls, and that between the cross joists at the centre line between the retort-houses, are covered by cast-iron floor-plates and gratings. For half the length of each retort-house, too, a row of ventilating-gratings, 4 feet long, are placed. Between the houses, from the stage-floor, are three stairways leading to the ground-floor. The whole of this work, it is needless to say after this description, is of a solid character, and spacious—the floors between the outer walls and benches being 30 feet wide; and the central floor between the bench in one house and that in the other 60 feet wide. This gives a remarkably fine clear space for working, and will assist materially in keeping the temperature of the house in comfortable working condition. Even on the side stages, when the charging and drawing machines are at work, there is ample passage way between them and the outer walls.

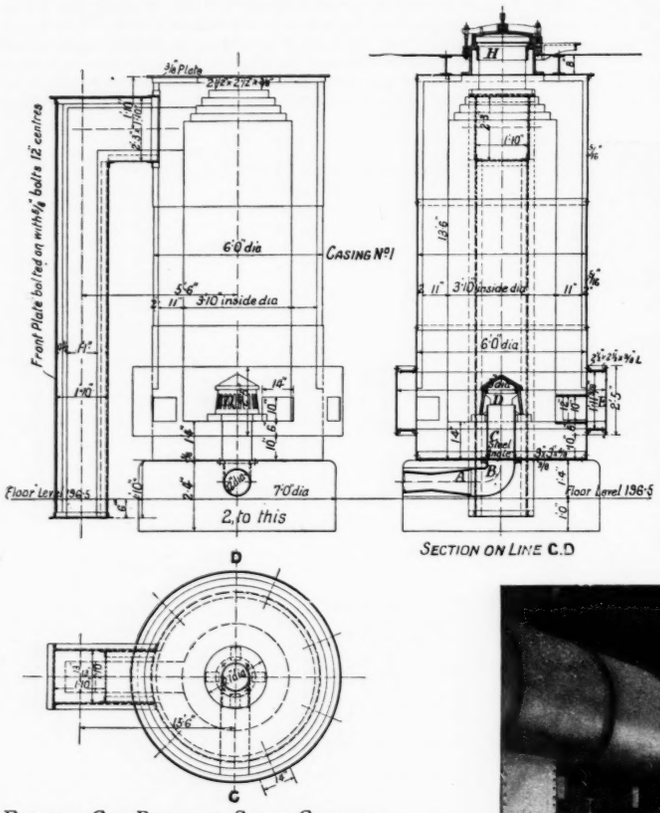


FIG. 10.—GAS-PRODUCER STEEL CASINGS.

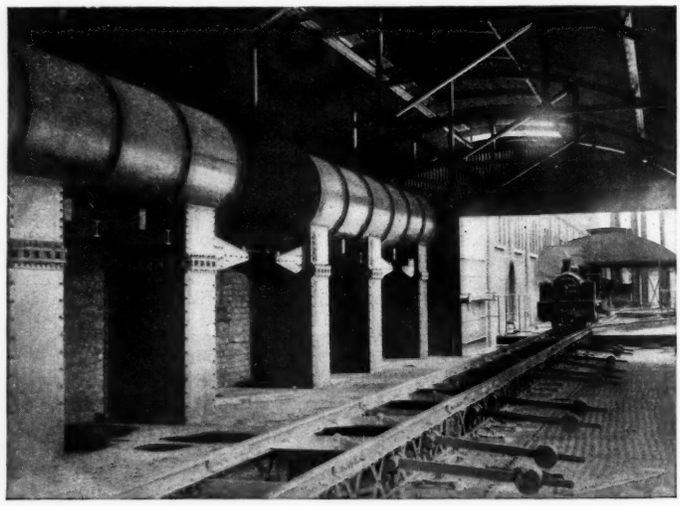


FIG. 11.—CHARGING-STAGE FOR THE OUTSIDE PRODUCERS.

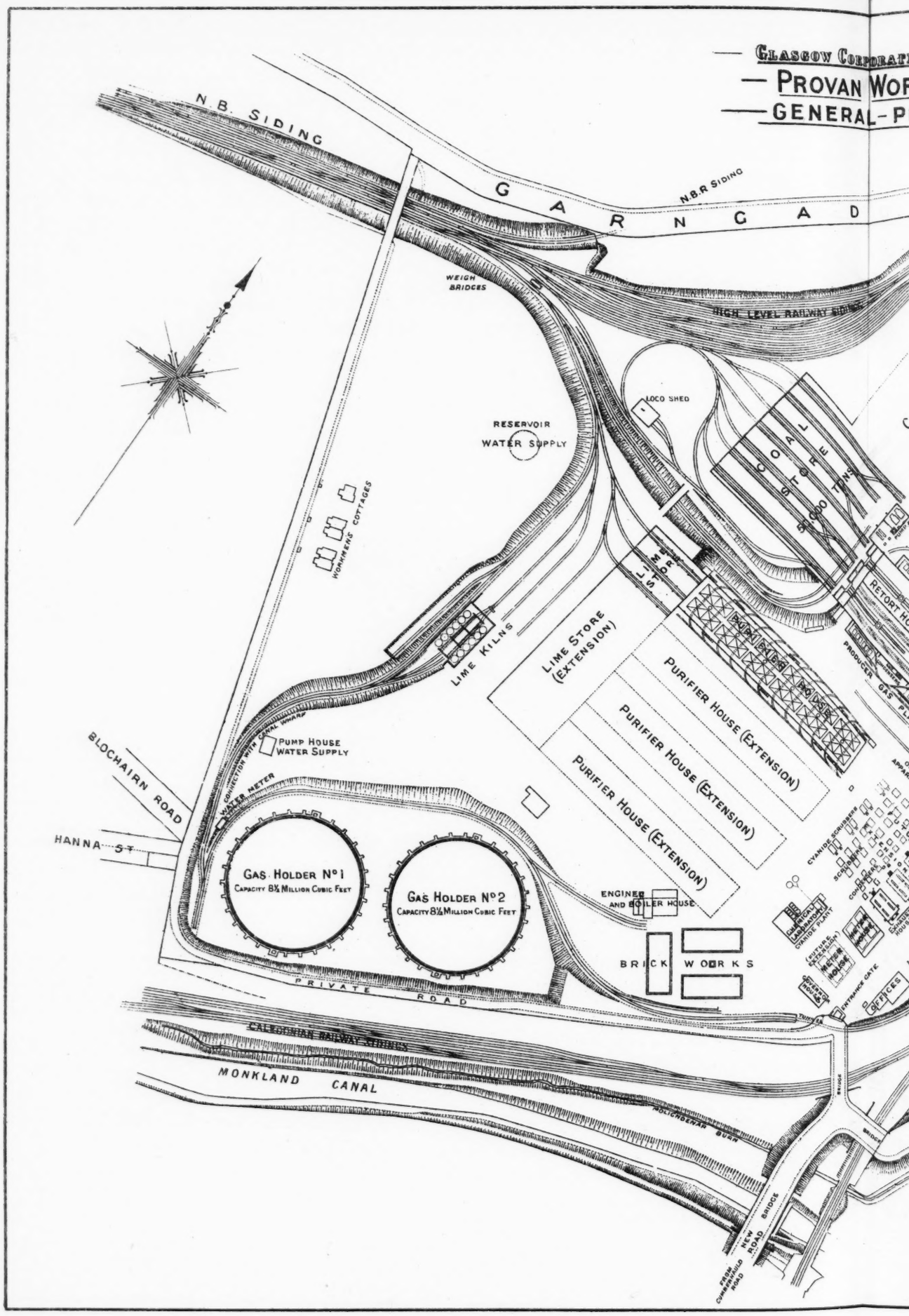
THE RETORT-BENCHES AND PRODUCERS.

Although we have now reached the most important part of the retort-house—that is to say, the settings—there is not a great deal to say about them; but what is left unsaid in the description, will in the main be gathered from the drawings. Solidity, as will have been seen, is one of the fundamental principles of Mr. Foulis's work; and throughout the finished and uncompleted settings, it meets the eye of the visitor. Commencing at the foundations of the benches, it is learnt that they rest on a bed of concrete, 20 feet broad and 3 ft. 6 in. thick, with arms 4 ft. 3 in. wide projecting 7 ft. 1½ in., at 10 ft. 2 in. centres, to carry the piers for the retort-house floor inner columns. On this concrete, in places, it has been necessary, owing to the variation of levels, to build up brick piers 18 ft. 1 in. long by 3 ft. 1½ inches thick, carried up to within 5 ft. 3 in. of the producer-floor level. From these piers four ring brick arches have been formed. Above the springers of the arches, the piers are 2 feet thick to the producer-floor level. Between the piers, above the arches, and also on the concrete where piers and arches are not required, solid brick work has been carried up to the producer-floor level. The settings (which were built by the Gas Department's own workmen) are of the usual regenerative type, with outside producers; and the drawings will convey more as to their character than verbal description. In the completed house there are 60 beds of twelve retorts, 9 ft. long by 16 in. by 23 in., or in all 720 retorts. The retorts are of ⌂ shape, with their sides curved to a radius of 5 inches. The ovens are all built in the second house, but are not yet fitted with retorts.

The settings are fed by four sets of three outside producers, grouped together in sixes; and, as this was a feature of Mr. Foulis's practice in latter years, the rather more extended particulars which we are now able to give will be of interest. These outside producers are similar to those in use at the Dawsholm works, and are rectangular in form. They stand on foundations of concrete; each bed being 74 ft. 6 in. by 28 ft. 3 in. by 12 in. thick. Each producer casing is 9 ft. 4 in. long, by 6 ft. 4 in. wide inside measurement, and 13 ft. 3 in. high, and is constructed of mild steel plates and angles. The plates are connected together at the corners by angle bars; and the sides are strengthened by rolled steel joists and angle-bars. The producers are lined with fire-bricks, with a layer of slag wool between the bricks and the plates. Completed in this manner, the inside area of each is 7 ft. 6 in. by 4 ft. 6 in., and 10 ft. 9 in. from the top of the grate to the top of the producer. They are fitted with Duff grates, and, of course, a steam-blower. Each producer is provided with two charging mouthpieces; the coke being fed from a charging-stage through sheet-iron hoppers, 10½ in. high, 26⅝ in. square at top, and 12 in. diameter at the bottom. A flue, 2 ft. 1 in. by 3 ft. 5 in., and about 8 ft. high, is fitted to each producer casing; and this flue contains the regulating-damper and all the necessary gearing to work it.

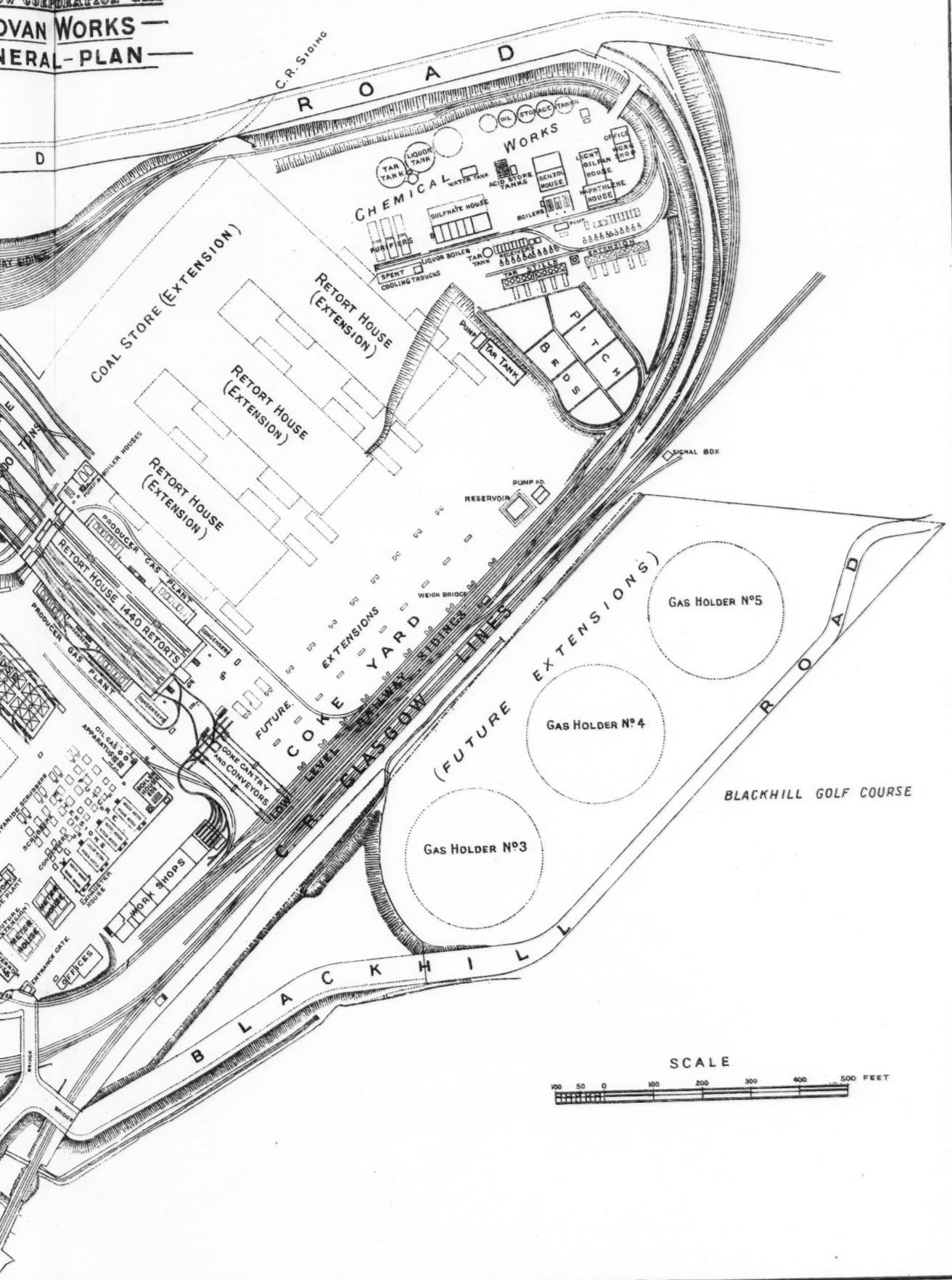
The main flue casings required between the producers and the retort-benches are a very interesting part of the installation. They are built up of ¼-inch steel plates, and 2½ in. by 2½ in. by ⅜ in. angles; and the lengths needed of a variety of inside dimensions are as follows: 805 feet of casing 3 ft. 8 in. high by 3 ft. 7 in. wide, 134 ft. of 3 ft. 2 in. high by 5 ft. 2½ in. wide, and 231 ft. of 4 ft. 10 in. diameter. These main-flue casings are placed on either side of the retort-bench; and from them are carried 120 vertical flue connections. It was found necessary to put in a dust chamber to each set of producers, in order to prevent any particles being carried forward. These chambers, which are 11 ft. 4 in. long by 6 ft. 10 in. wide and 22 ft. high, are made up of ¼-inch plates, connected together by 3 in. by ⅜-in. by ⅜-in. angles. Around each group of producer casings are platforms, 90 feet long and 24 ft. 6 in. broad, supported on steel columns and rolled steel joists; and there is a centre platform 108 feet long connecting these two main platforms. Over each set of producers is a galvanized iron roof, supported by a steel-joist structure, with T-bar principals, purlins, and diagonal bracing. An inclined railway, carried on cast-iron columns and rolled steel joists, extends from the ground line to the platforms around the producers; and the rails are continued along the platforms. By this railway, a small locomotive carries up the coke for feeding into the producers. This is an extremely interesting part of the retort-house plant; and the adoption of the system on such a large scale is proof of Mr. Foulis's satisfaction with his previous experience. The percentage consumption of fuel by the large producers does not vary much from that of producers of the usual design; but the cost for attendance is much reduced.

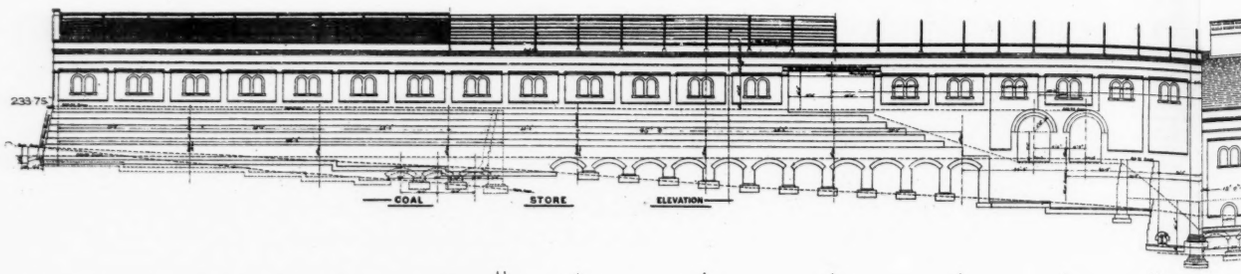
We must return to the retort-house for the purpose of glancing at the retort-bench fittings; but there is nothing very special to be said about them. The mouthpieces are, of course, of the self-sealing type; and the ascension-pipes are of 7 inches diameter. The hydraulic main is continuous over each bench, of ⊐ section, and fitted with valves for regulating the seal. Mr. Foulis had a preference for the continuous main; but, in all probability, in the next house there will be a separate section for each bed, in accordance with the more general modern practice. The foul

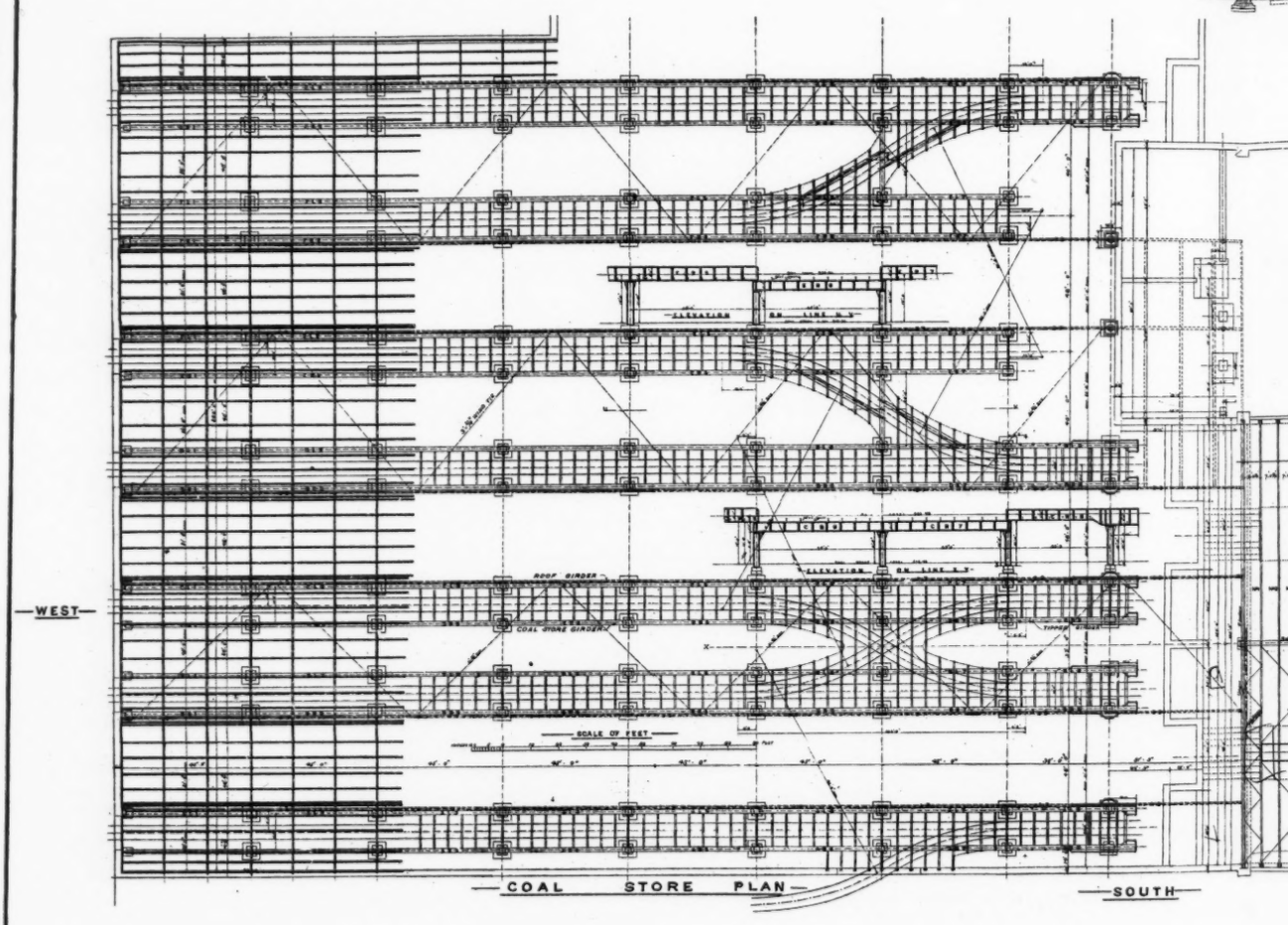

GLASGOW CORPORATION
PROVAN WORKS
GENERAL PLAN
N.B. SIDING
N.B.R. SIDING
GARNGAD
WEIGH BRIDGES
HIGH LEVEL RAILWAY BRIDGE
LOCO SHED
RESERVOIR
WATER SUPPLY
WORKMENS COTTAGES
LIME KILNS
LIME STORE (EXTENSION)
PURIFIER HOUSE (EXTENSION)
PURIFIER HOUSE (EXTENSION)
PURIFIER HOUSE (EXTENSION)
RETORT HOUSE
PRODUCER GAS PLANT
PUMP HOUSE WATER SUPPLY
WATER METER
BLOCHAIRN ROAD
HANNA ST
GAS HOLDER No 1
CAPACITY 8½ MILLION CUBIC FEET
GAS HOLDER No 2
CAPACITY 8½ MILLION CUBIC FEET
ENGINES AND BOILER HOUSE
BRICK WORKS
CYANIDE SCRUBBERS
CHEMICAL LABORATORY
CYANIDE PLANT
METER HOUSE
ENTRANCE GATE
OFFICES
PRIVATE ROAD
CALEDONIAN RAILWAY VIADUCT
MONKLAND CANAL
POLMADIE BURN
NEW ROAD BRIDGE
FROM CUMBERNAULD ROAD

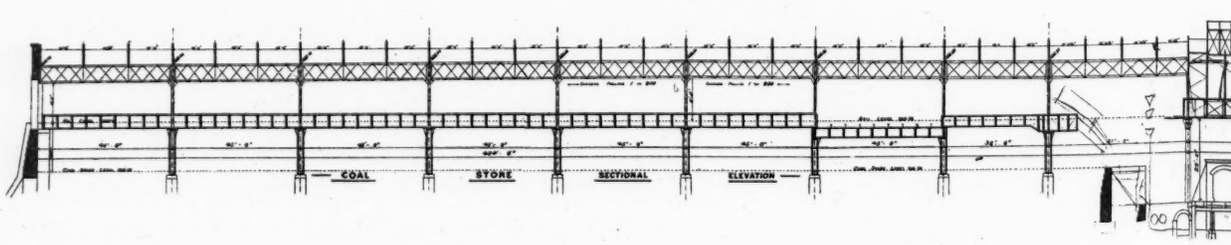
No. 1

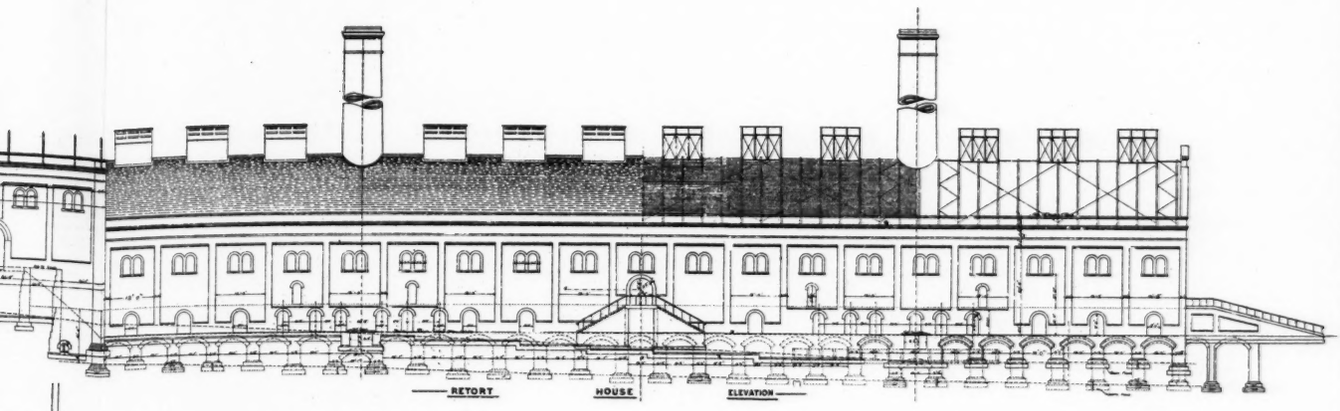
...ow Corporation Gas —
...OVAN WORKS —
...NERAL-PLAN —




233 75
COAL STORE ELEVATION


WEST
ELEVATION ON LINE A-B
ELEVATION ON LINE A-B
ROOF GIRDER
COAL STORE GIRDER
SCALE OF FEET
COAL STORE PLAN
SOUTH


COAL STONE SECTIONAL ELEVATION

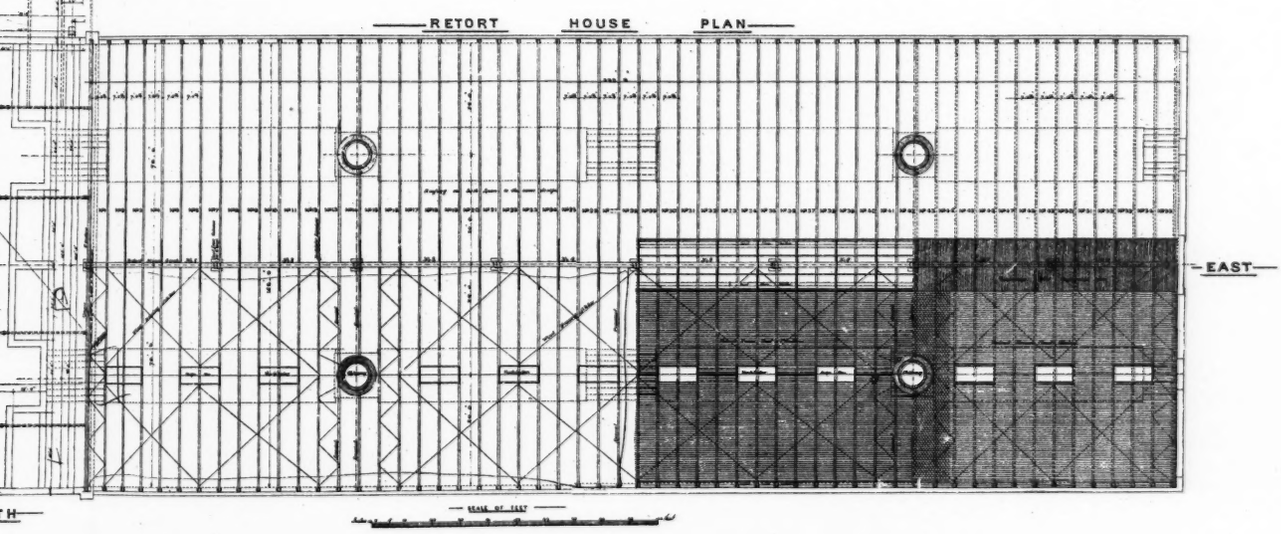


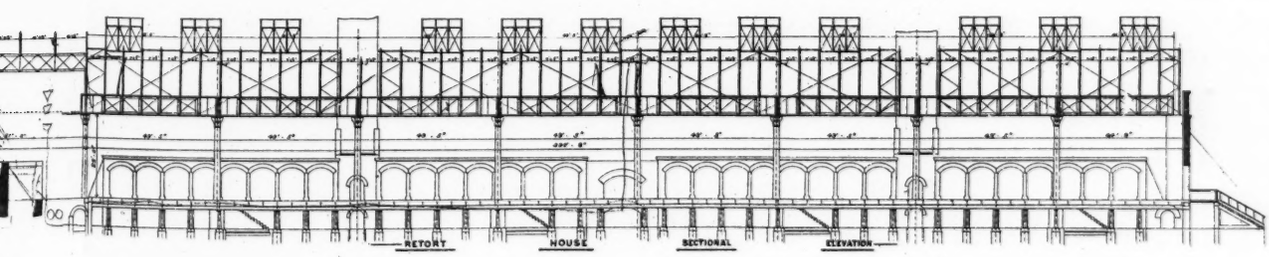
— GLASGOW CORPORATION GAS —

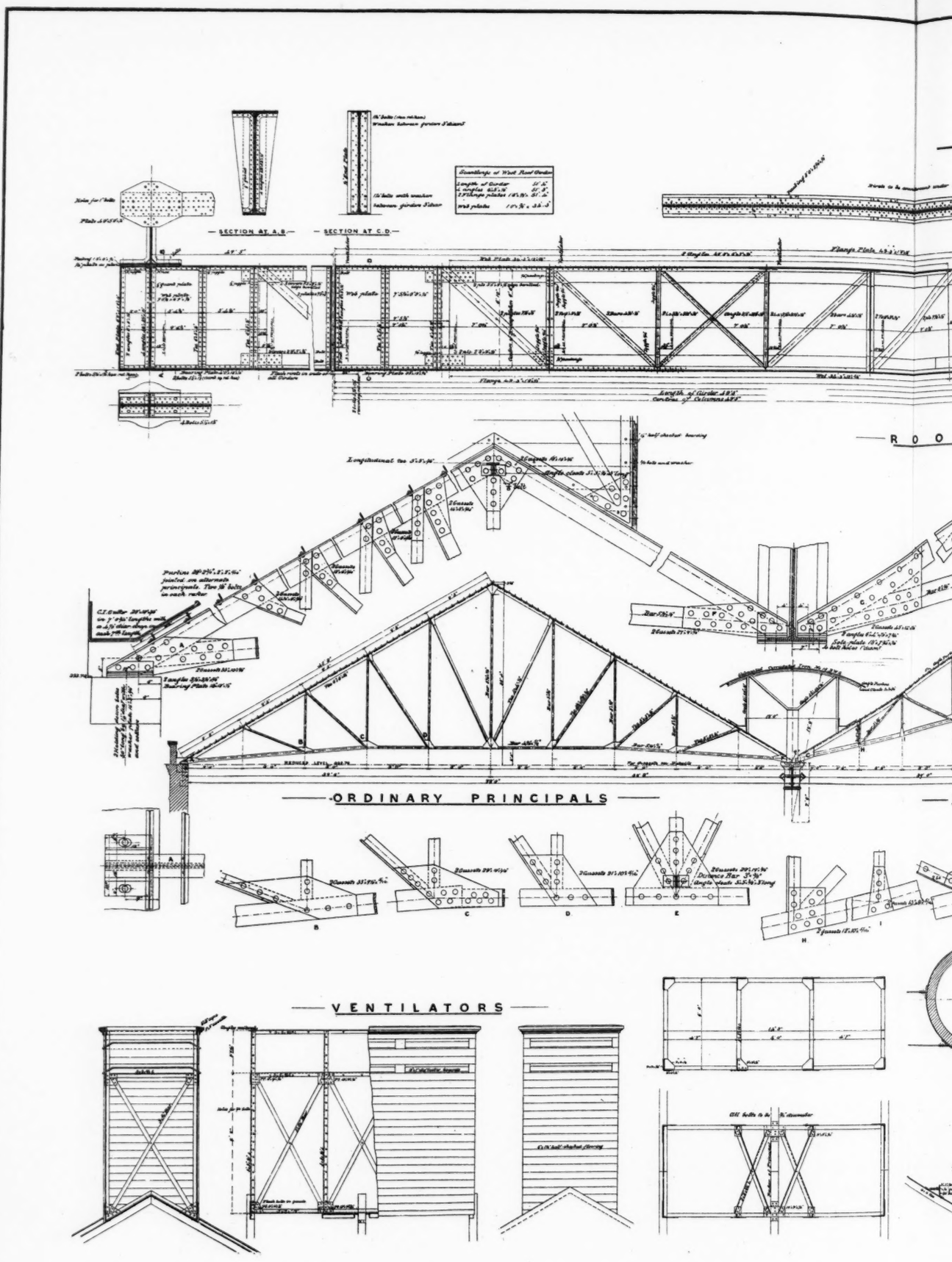
— PROVAN WORKS —

—GENERAL PLAN OF—

—RETORT HOUSE AND COAL STORE.—





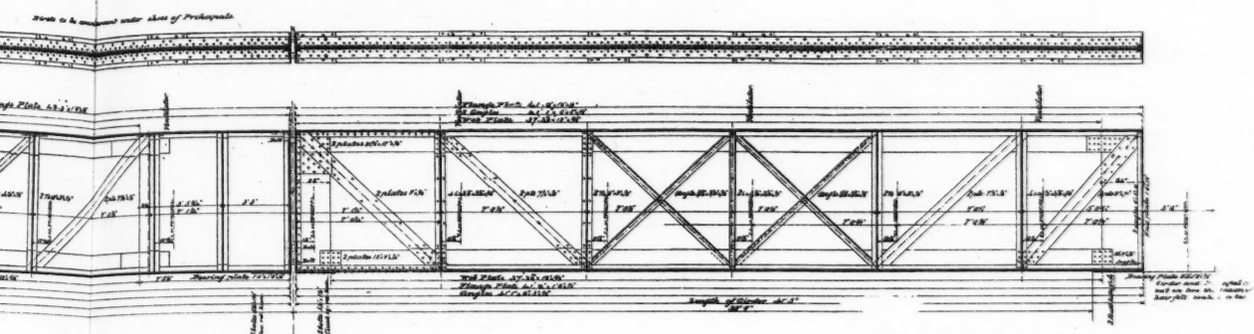

SECTION AT A.B.
SECTION AT C.D.
ROO
ORDINARY PRINCIPALS
VENTILATORS

No. 3.

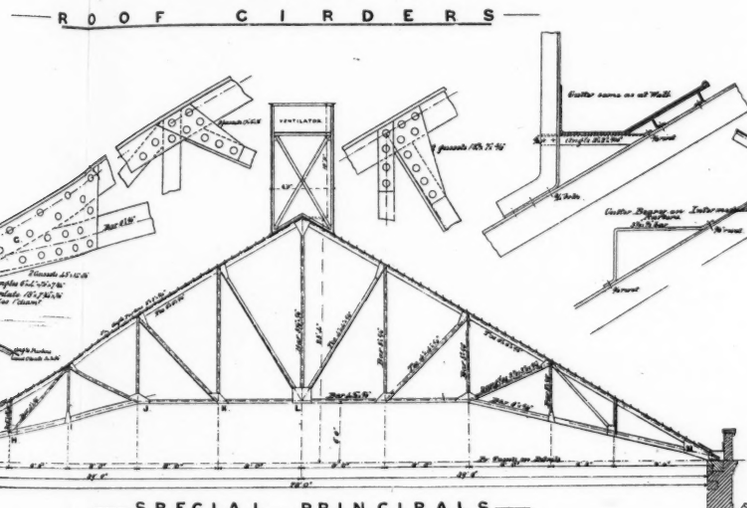
— GLASGOW CORPORATION GAS —

— PROVAN WORKS —

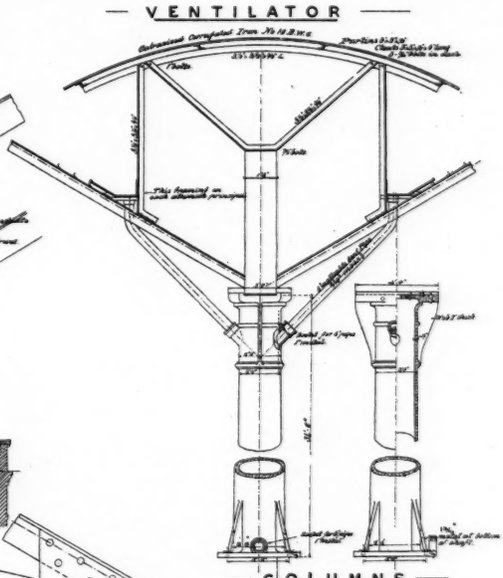
— RETORT HOUSE — DETAILS OF ROOF. —



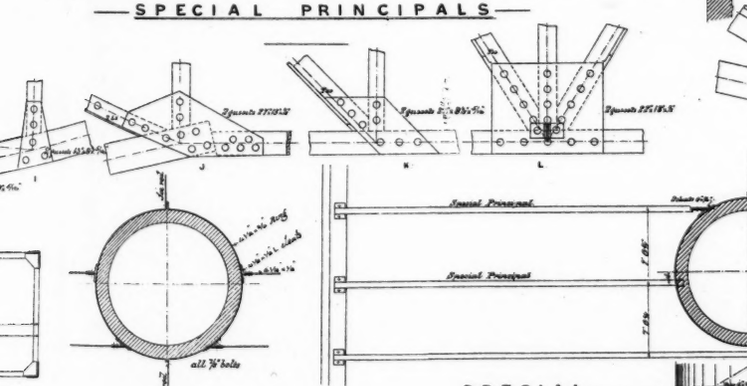
— ROOF GIRDERS —



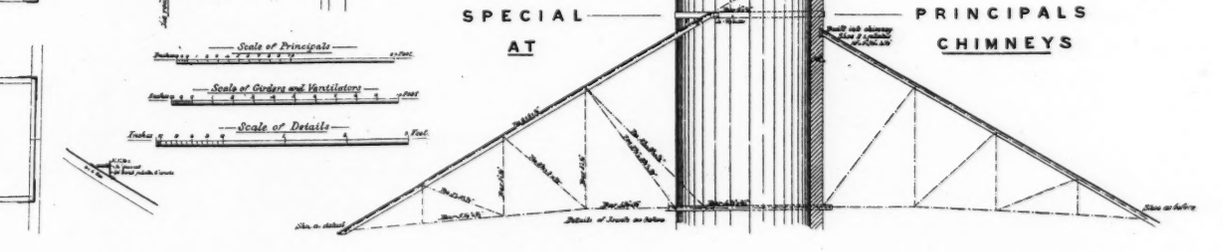
— VENTILATOR —



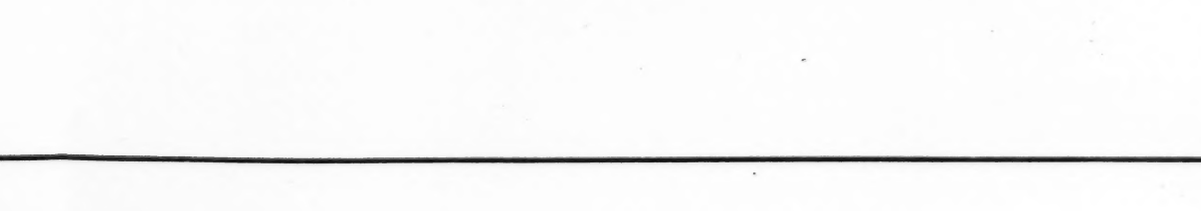
— SPECIAL PRINCIPALS —



— COLUMNS —



SPECIAL PRINCIPALS AT CHIMNEYS



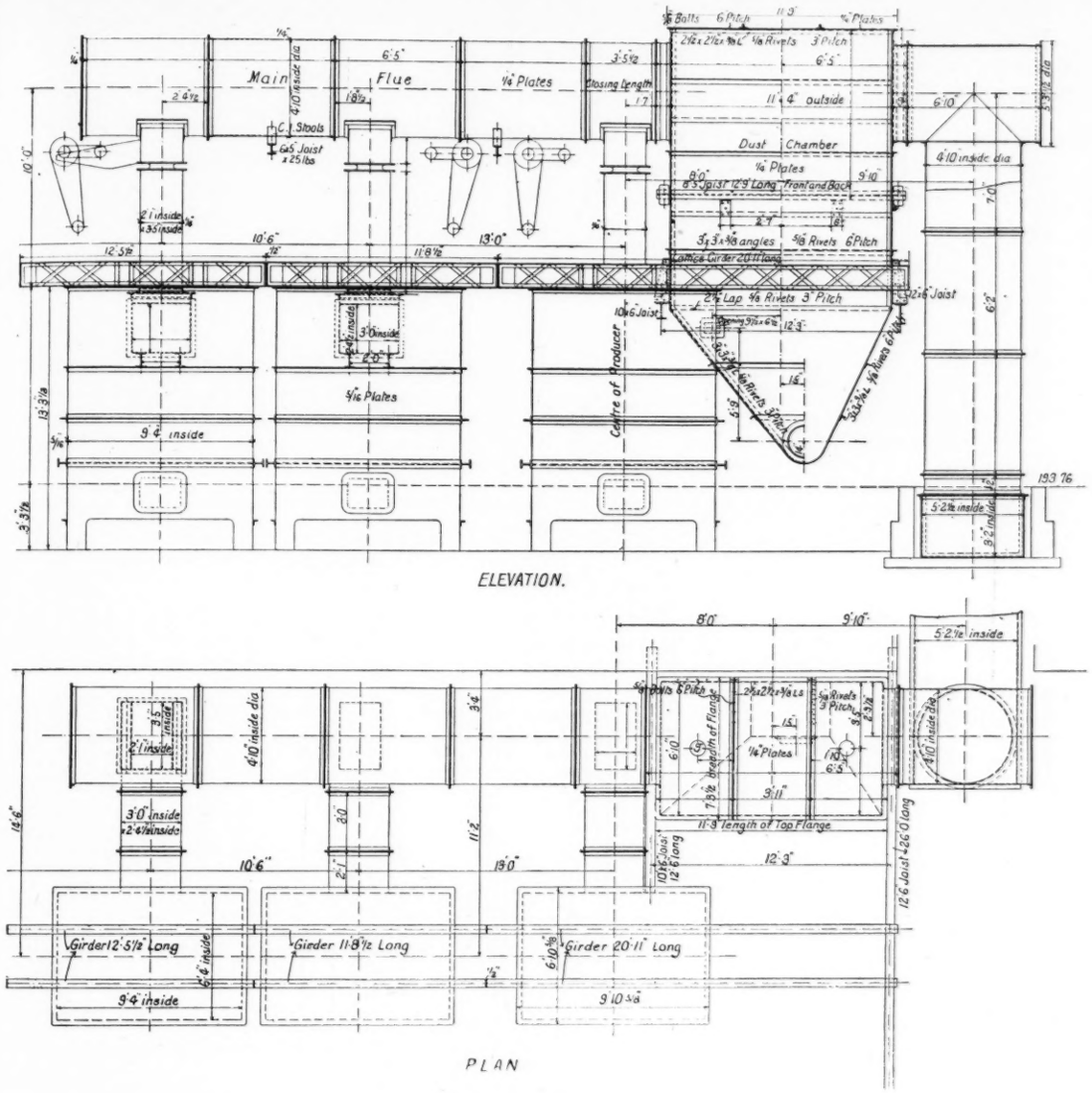


FIG. 12.—GENERAL ARRANGEMENT OF PRODUCERS AND FLUES, GIRDERS, AND DUST CHAMBERS.

mains are of steel, and 24 inches diameter. They run down the house; and large cross pipes (as seen in one of the photographs) connect them up to the hydraulic mains.

There is nothing more to be said about the retort-house and the settings. The coal plant and charging and drawing machinery will be referred to in dealing with the coal-stores, and the method of coke removal in describing the general system of dealing with the coke. At the present time, only part of the retorts in the first house are under fire; and carbonization is proceeding in a number of the beds. But they have not been hurried, and have not yet been carried up to what will eventually be their regular working heats. Under these circumstances, and seeing that the work—its very largeness prohibits it—cannot possibly settle down into normal conditions until rather more advance has been made, it is impossible to give any definite information as to working results. Additions to the beds heated up are being gradually made. But these are big works; and Mr. Wilson prefers to bring them up to their full working pitch by easy stages.

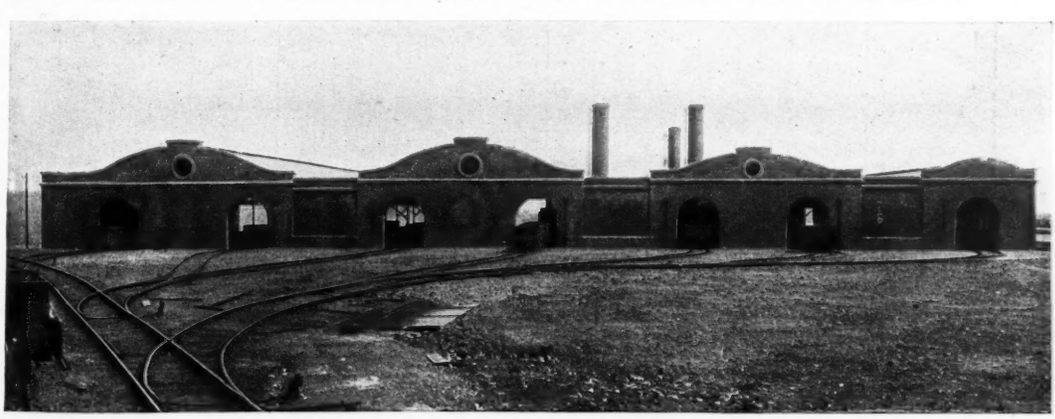


FIG. 14.—WEST END OF COAL-STORES—TRUCKS ENTERING FROM GROUND-LEVEL ON TO STORE OVERHEAD RAILWAY.

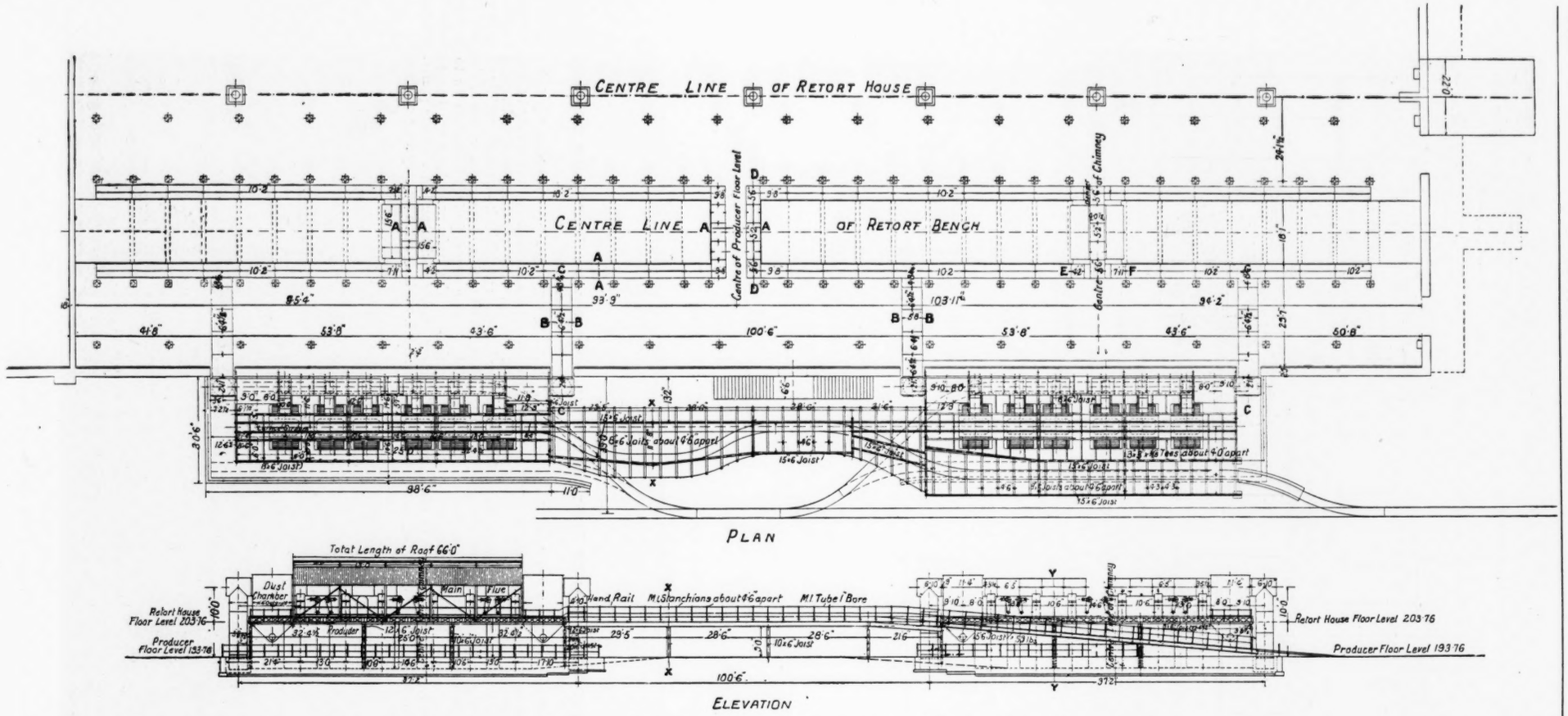


FIG. 13.—GENERAL ARRANGEMENT OF PRODUCERS AND FLUES FOR THE RETORT-HOUSE, SOUTH SIDE.

THE COAL-STORES.

Interest will already have been engaged for the coal-stores by the statements made as to the influence that the differences of levels of the site have had upon the arrangement adopted in dealing with the coal deliveries, which are brought in by railway truck at the ground-level, and passed at once through the west wall of the coal-stores, on to an elevated railway, which gradually varies in height from the floor of the stores between 17 and 13 feet or thereabouts, It may be remarked in this conjunction that the stage-floor of the retort-house is about 13 feet below the floor of the coal-store. Above, the coal-store is quite open to the retort-house; and on the stage-floor of the retort-house, one can stand and watch the methods that are followed high above, of dealing with the incoming coal.

However, adopting the same system of treatment for the coal-stores as was followed in the case of the retort-houses, we will notice the building itself first, and follow with the internal arrangements. The coal-store is continuous along the west ends of the retort-houses of this first section. It measures 408 feet long from the end of the retort-houses to the inside of the gable wall at the west end of the store; and it is 292 feet wide. This will give a storage capacity of about 50,000 tons. For the stores, a heavy amount of excavation work had to be done; and a considerable extent of substantial retaining wall had to be constructed at the west end, for 17 feet above the floor-level, and with piers of 4 ft. 1½ in. long, by 3 ft. 9 in., and 3 ft. wide, to carry the girders of the elevated railway. This all meant a substantial expenditure; but it was the means to an economical end. The side walls of the stores are of the same thickness, and of similar design, to those of the retort-houses. The west wall above the retaining wall is 2 ft. 4½ in. thick below the cornice, and 2 ft. thick above that level. Between the four gable walls of the stores, the wall is reduced to 18 inches thick above the base; this being 2 ft. 4½ in. thick. Piers 3 ft. wide by 18 in. long, are carried up along with this wall on the inside, and are capped with a bearing-stone (18 inches deep) for the roof girders. Proceeding to the other end of the store, between it and the retort-house another retaining wall (resting on concrete foundations and brick piers) has been

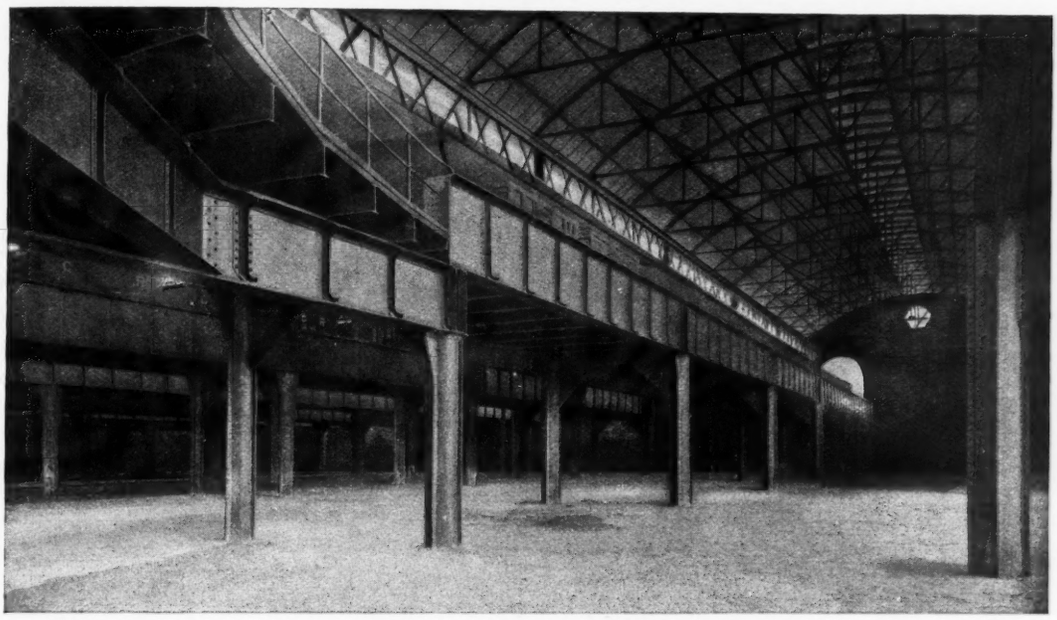


FIG. 15.—THE COAL-STORES AND OVERHEAD RAILWAYS.

carried up some 13 feet above the retort-house floor-level, with a concrete coping 2 ft. 3 in. wide and 9 inches thick. Across the same end of the retort-house is built an 18-inch wall up to the retort-house floor-level; and into this are bonded the cross walls and column piers. The walls of the store contain several arched openings. The other features, so far as the brick structure goes, are of minor importance. Between the supports of the overhead railways, the store is paved with square-dressed whin setts, 7 in. by 4 in., grouted with lime, laid on sand on a 6-inch bed of concrete; the remainder of the floor being laid with Ferrolithie.

Turning to the roof, it is seen that it has been built in eight spans. Altogether, for the support of the roof there are 54 columns composed of 10 in. by 8 in. steel joists, fixed to the tops of the steel columns to be referred to presently. Between the columns run the roof girders, of which in all there are 62 of 6 ft. deep and 8 in. wide, of lengths varying between 35 ft. 7½ in. and 51 ft. 8¾ in. The last of the four girders rest on cast-iron columns, 32 ft. 2 in. long, and 18 in. diameter at the top and 24 in. at the bottom. The roof of the store rests alternately on the top and bottom members of these girders. At the retort-house end of the store, two heavy cross girders are fixed between the side walls and the main girder supporting the retort-house roof. These girders are 79 ft. 9 in. long and 7 ft. 8 in. deep. As previously stated, the roof is of eight spans. The one next the north wall consists of straight principals, and is covered with corrugated iron sheets resting on purlins. All the other spans have circular roofs, of galvanized sheet iron (No. 16 B.W.G.), and bent to suit the curve of the principals.

THE COAL-STORE OVERHEAD RAILWAY, AND THE METHODS OF COAL DELIVERY.

Through the coal-store there run, the full length, the elevated railway lines for the railway trucks delivering the coal. It should be explained that the works' railway sidings are connected to both the North British and the Caledonian lines; and the coal can be brought in by either. It may be convenient to notice here the web-work of sidings and lines there is about the place for the transport of material here, there, and everywhere. Altogether,

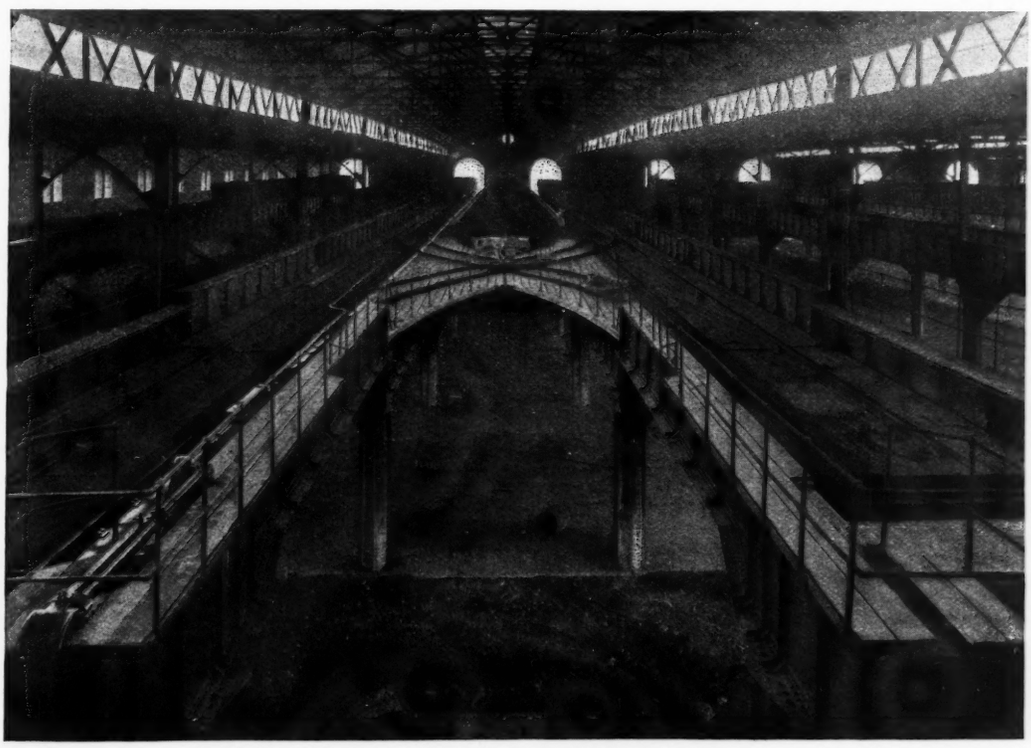


FIG. 16.—COAL-STORE AND VIEW ON TOP OF OVERHEAD RAILWAYS—SHOWING TRUCK-TIPPING MACHINE AT END OF PLATFORM ON THE LEFT.

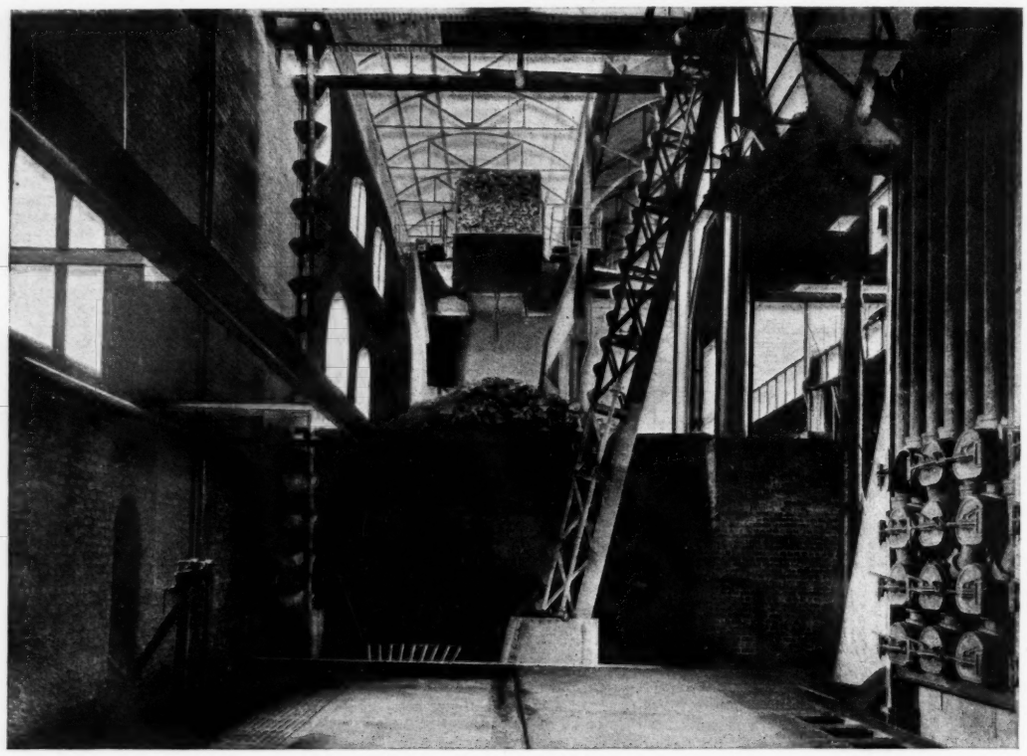


FIG. 17.—COAL-HANDLING PLANT FROM COAL-STORE TO RETORT-HOUSE—SHOWING RAILWAY TRUCK TIPPED READY FOR DISCHARGING.

there will eventually be about 8 miles of broad-gauge line for ordinary railway truck work, and 5 miles (eventually) of narrow (2 ft. 6 in.) gauge tracks for the small trolley-hauling locomotives which spin about the place—more particularly in connection with the coke-handling arrangements. The siding accommodation that is provided for will be sufficient to deal with 4000 tons of material daily. However, the incoming coal-waggons are marshalled on the sidings; and then, when necessary, in order to get their ends the right way about for running on to the elevated railways in the store, they are carried round a loop-line (shown on the ground plan).

We must give a few structural particulars of these store overhead railways, of which at present seven have been constructed. The bearing columns are of 20 inches external diameter, formed of four $\frac{3}{8}$-inch steel plates, bent hot, and filled solid with concrete. They vary in length from 16 feet to 12 ft. 7 in., and rest on built piers. The girders (which are of various sizes between 3 ft. 3 in. and 5 ft. by 1 ft. 6 in. wide), carried by these columns, are constructed of $\frac{3}{8}$-inch plates, and $3\frac{1}{2}$ in. by $3\frac{1}{2}$ in. by $\frac{1}{2}$ in. angles, stiffened by 6 in. by 3 in. by $\frac{1}{2}$ in. T bars. Resting on the lower flange of the 5-feet girders are rolled joists, 13 ft. $6\frac{1}{2}$ in. long by 14 in. by 6 in.; and on the smaller girders there are joists of smaller dimensions. On the joists are fixed longitudinally the timber sleepers; and on these again are laid the flat-bottomed steel rails. The space between the rails is open; and that between the girders and the rails is provided with wooden covers, which can be lifted as desired. The coal which is placed in stock is emptied through the bottom of the platform; but to supply the coal required for current use, the trucks are run along the full length of the rails to the west-end of the retort-houses, where, by means of a hydraulic tipping-machine (one at the end of each platform), the trucks are tilted and the coal shot into the main storage hoppers, situated between the retort-houses and the coal-store. The truck tipping-machines are worked by water at a pressure of 500 lbs. per square inch. The pumping-station for this purpose, and for supplying the hydraulic charging and drawing machines, is described below. There are two main coal storage hoppers for each retort-house, one on either side of the bench; and their individual capacity is 50 tons each. Standing on the stage-floor of the retort-house, the emptying of a truck is a sight worth seeing (if one is a respectable distance from the dust). High aloft, the truck is seen brought to the end of the rails, the men on the platforms knock out the fastenings from the end door, the truck is tilted, and, in certainly not more than a minute, the whole of its contents has been deposited in the main storage hoppers below. From this it will be seen that the costs of coal delivery

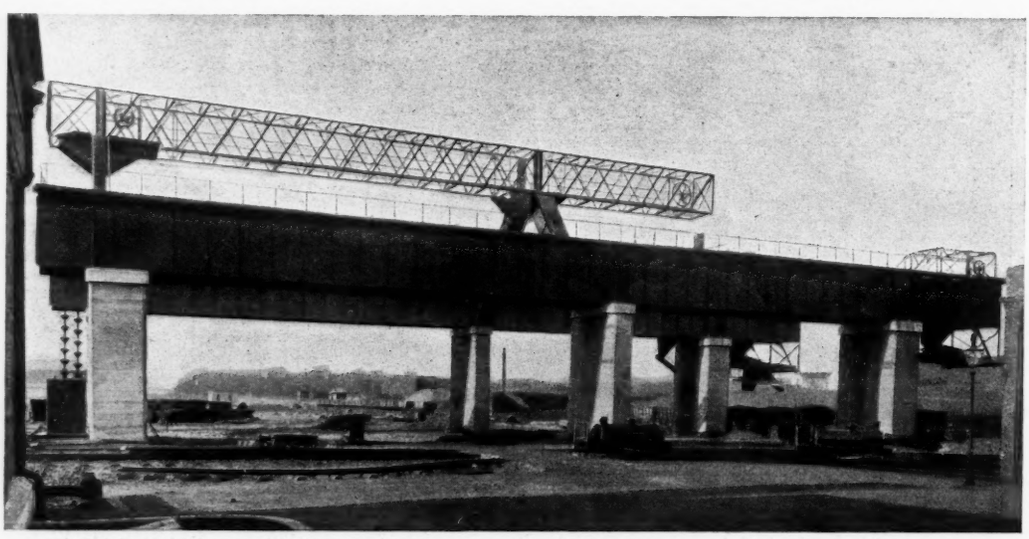


FIG. 18.—THE ELEVATED PLATFORMS AND CONVEYORS FOR COKE STORAGE.

and handling have been reduced to a minimum by causing the differences in the level of the land to serve towards that end. That is good engineering.

Retort-House Coal Feeding Plant.

We have now brought the coal to the retort-house; and before describing any of its coal plant, it will be useful just to trace the course of the coal in a general way. Each of the main storage hoppers has a coal-breaker beneath; and from the breakers, the coal is carried, by a continuous system of gravity bucket conveyors (which also serve as elevators), to overhead hoppers for feeding the charging-machines, which, of course, are of the Arrol-Foulis type, brought, by the introduction of the latest improvements, quite up to date. The principle of these machines has not in any way been affected; but there have been from time to time certain changes in parts which have been useful—such, for instance, as improved motors, and coal-feeding arrangements. There are two charging and two drawing machines on each side of the first house. We have already mentioned the hydraulic plant which supplies them; but it may be stated that the house accommodating it is situated in the space which will form the division between Nos. 1 and 2 and Nos. 3 and 4 retort-houses. The plant consists of two Babcock boilers, filled with Meldrum furnaces and feed-pumps. The boilers are capable of evaporating 8000 lbs. of water per hour. The hydraulic engines (which were designed in the Engineer's office, as, in fact, was all the plant, excepting the specialities here and there) are in duplicate. They are compound engines, with three cranks, and are capable of pumping 18,750 gallons of water an hour, at 30 revolutions per minute.

Now we will return to the coal-breakers, in order to give a little information as to their construction. The side plates are of mild steel, secured at each corner by stay bolts. The top roller shafts are 8 inches diameter in the centre, the journals 7 inches, and the ends where the wheels are fixed 6 inches. On each of the top shafts, there are six cast-steel claw-plates, each plate having four claws. The bottom rollers are of mild steel, and have longitudinal grooves cut their full length, and hard steel pins driven in by hydraulic pressure. These bottom rollers are 10½ inches diameter, the journals 7 inches, and the ends for the wheels 6 inches. The bearings for the shafts are of cast iron, lined with Richard's plastic metal ⅝ inch thick to the outside of the side plates. The openings for the bottom roller bearings are sufficiently large to allow of the bottom rollers being withdrawn. The whole of the spur gearing is made in cast steel, shrouded on both sides of the teeth to within ⅛ inch of the pitch line, and keyed to the shafts with sunk keys, having gib heads. Between the side plates of the breakers, ¾-inch steel plates are fixed by angle-bars for guiding the coal; and above each breaker is bolted a hopper, 4 ft. 7 in. by 3 ft. 4 in. and 18 in. deep. For the purpose of driving this plant, two horizontal steam-engines are employed.

There is little supplementary matter to be given about the gravity-bucket conveyors. This type of conveyor appears to be much appreciated at Glasgow; it being considered that, for convenience and durability, it is without equal. It is seen in this house that it can be carried along horizontally, suddenly take a sharp bend, rise vertically; and, in fact, with little persuasion, it seems possible to carry this form of conveyor wherever wanted. It has already been stated that the conveyor is continuous. It can be filled from either of the coal-breakers or main storage hoppers; and it is capable of carrying forward—each bucket will hold 2 cubic feet—about 35 tons of coal per hour. From the coal-breakers it is run under the retort-house floors, and then rises vertically to a height above the benches, passing along to the overhead hoppers, and away back to the breakers. Of overhead hoppers, there are four for each house—in reality, they are double hoppers crossing the benches, and each holding about 30 tons. The charging-machine hoppers will hold 10 tons; and, mentioning this, reminds us, that the method of work at Glasgow is conducted in this way: Eight beds are taken at a time; and half of the retorts are charged, so that 48 retorts represents a round. The charge put into each 9 feet retort is about 3 cwt.; and therefore a single round requires 144 cwt., or about 7 tons. Thus, there is ample margin in the machine hopper.

Coke Methods and Plant.

The carbonizing and auxiliary plant will be completed by referring to the arrangements for dealing with the coke. There is originality in certain of the arrangements, which also embraces an imposing feature in the works equipment. The coke as it is drawn from the retorts falls into shoots in the stage-floor, and each shoot is in effect a hopper, as is seen by descending to the producer-floor level. The outlet of the shoot is controlled by a door, which, if kept closed, will accommodate a whole spent charge. The object of this is to prevent delay in discharging the retorts. The hot coke is carried away by bogie trucks, drawn by small locomotives on the narrow-gauge railway. The usual method of working is for a train of bogies to be in position when drawing is going on, and to receive the spent charges directly through the shoots; but should there not be, from any cause, a train of bogies immediately available, this does not occasion any hitch in the drawing, in view of the provision made for retaining the spent charges in the shoots. While making these observations, as the discharging of the retorts is proceeding above, it is remarked that under the stage is just as preferable a place for working in as above it; for the ventilating plates which were referred to in describing the construction of the stage-floor, are very effective in clearing the ground-floor of the smoke and dust caused by the falling coke; and, were it not for the largeness of the clear space in the house, this would, we are afraid, be to the discomfort of the men working on the stages.

However, the coke is drawn by the small locomotives and bogies outside the house, and carried away to coke-quenching sheds (of which there are to be two for each retort-house), situated adjacent to the stupendous coke storage and loading plant, or otherwise in its hot condition to the outside producers. But it is the coke which is to go into storage or truck with which we are now dealing. The coke-quenching sheds into which the bogies are backed are built just large enough for their accommodation. At the top, they are each provided with a short shaft for carrying away the steam and smoke, and also with water-tanks. The man in charge, when a bogie is in position, simply pulls a string outside; and the hot coke receives a tremendous shower of water, which quickly quenches it. This plan of dealing with it in the bogies also allows the coke to drain well. From the quenching-sheds the bogies are drawn to one of three capacious underground hoppers, of conical form, which feed into gravity bucket elevators, which also serve as conveyors along the overhead coke-distributing and storing platforms. The buckets, as in the case of the coal conveyor, will hold 2 cubic feet. At the moment, there is only one of these elevators and conveyors at work; but as the others are being constructed now as rapidly as possible, we will deal with the plant in its entirety.

A better appreciation of the description of the overhead platforms will be gained if the reader first consults the photographic illustration. This and the dimensions of the structures will indicate not only its great strength and massive proportions, but the extensiveness of the area over which, and the height from which, the coke can be distributed. It will be noticed that in all there are (what we will call for simplicity in description) three conveyor platforms, arranged parallel; but the central one is raised to about double the height of the two outside ones. The bottoms of the buckets of the outside conveyors are about 25 feet above the ground level, and those of the central one about 50 feet; so that coke can be stacked here to a great height when necessity requires. The lower platforms are supported each on three massive concrete piers about 24 feet high, and at 72 and 85 feet centres respectively; the elevated central platform being carried by rising girders from the outer ones. Each platform consists of four plate main girders, 9 ft. 6 in. deep and 13 in. wide over the flanges, placed at 12 feet centres. Two of these girders are 99 ft. 9 in. long, and two 93 ft. 7 in. long. The girders are bolted to the piers by bolts 15 inches long, and 1½ inches diameter. At the east end, the girders overhang the piers some 26 feet, and at the west end by 6 ft. 10 in. The lower floor of the platform is formed of 33 rolled joists, 8 in. by 6 in., resting on the lower flanges of the main girders, and riveted to the web of the girders by brackets and angle cleats. The upper floor is formed of 42 rolled joists, of varying lengths, riveted to the flange of the main girders and to the extended ends of the kneed T stiffeners of the girders. Under the upper joists and riveted to the flanges of the girders and to the joists are horizontal bracing-bars; and the end of the platforms are also braced by diagonal T-bars. Turning next to the central conveyor platform. This is supported by two plate girder bows, 26 ft. high and 52 ft. wide, erected the one at the western and the other at the centre piers. These support two lattice girders, 139 ft. 3 in. long by 9 ft. 6 in. deep, and 6 inches wide, overhanging 8 ft. 3 in. at the west end and 46 feet at the east end. The flooring is composed of 6 in. by 4½ in. rolled steel joists. The platforms have wooden floors, and, of course, carry all the usual rails and fittings for the class of conveyor employed.

The coke can be discharged at any point along the platforms by the use of tipping devices; and, when it is required to take from stock, this will be done by travelling-cranes and grabs running on rails on the high-level platform. These will deliver the coke into the conveyor, and it will be carried along to the riddles and loading shoots at the east ends of the outside platforms. The riddles (which are driven by the gas-engine working the conveyors) sort the coke into three sizes, which can be sent direct into three separate railway trucks on the adjacent lines, over three of which lines shoots are arranged to pass. Of course, the loading can also go on direct, through shoots, from the overhead conveyors without passing the coke through the riddles. It was learnt that it takes about 8-horse power to drive the conveyors; gas-engines being employed for the purpose.

This completes the account of all the plant in any way identified with both the retort-houses and coal-stores. The second article will follow the gas through the plant in the ordinary course of treatment.

The "Daily Chronicle" New York correspondent telegraphs that at a dinner given last Thursday at the Waldorf-Astoria Hotel, Sir William Ramsay announced that in his belief chemistry was on the eve of the discovery of the origin of ordinary elements. He based this statement on recent researches and experiments which he had made, and said he had discovered a new substance which he thought would lead to the attainment for which chemistry had been striving for many years.

THE BACTERIAL PRODUCTION OF SULPHURETTED HYDROGEN.

Organisms Capable of Polluting Coal Gas.

For some years past, it has been known what a large part is played by bacteria in the pollution and purification of certain waters, both potable and sewage. Where chemical analysis fails to determine the hygienic value of water, bacteriology is the ultimate guide; and therefore it is not surprising that this science—allied to Biology on the one hand and to Chemistry on the other—has lately become of increased importance. The improvements already accomplished by its aid in the domains of water-works and sanitary engineers have been of a most useful character; and as an aid to the elucidation of complex problems, its study is likely to be rewarded by further progress. To examples that can be drawn from these two branches of engineering must now be added the fact that these minute organisms can exist in an atmosphere of coal gas. Unexpected as this may be to most persons, there is collateral evidence that can be brought to explain and confirm the direct evidence of practical working and experiments in the chemical laboratory.

To the Gaslight and Coke Company and their technical staff must be given the credit for ascertaining the fact that bacteria may exist in a gas-pipe, and that they may be the means of adding traces of sulphuretted hydrogen to the gas passing through. At the Tudor Street Testing-Station of the Company (within the City of London) it was recently found that the gas for three days—two successive days and one after a few days' interval—gave stains in the Referees' test indicative of the presence of sulphuretted hydrogen, while in the laboratory of the Company immediately over the former room, no such indication could be obtained. Everything pointed to a local origin and Mr. J. G. Taplay, one of the Company's Chemists, traced it to the portion of the service-pipe supplying the statutory testing-place, which was found to contain a little water. In this water were the bacteria which, by subsequent tests, were found capable of generating sulphuretted hydrogen sufficient to stain acetate of lead paper and cause the Company to be liable to a fine of £50 per day. By taking a minute quantity of the scrapings and liquid from the inside of the lead pipe, it was found that clean gas could, by contact therewith, become fouled; and by placing a further portion of the same slime on sterilized nutrient gelatine, a plentiful crop of bacteria could be produced. The necessary precautions to prevent aërial contamination were observed; sterilized flasks, fitted with sterilized plugs, being used for the cultivation of the anacrobic organisms. After the piece of slightly concave lead pipe had been removed from the service, the contamination of the gas ceased, because that was the only portion where water could lodge and afford a home for the minute beings.

The question arises here as to what is the food upon which they subsist—seeing that oxygen is absent, and that hydrocarbons and carbon monoxide are the principal components of the environment. This point is being investigated by Mr. Taplay, whose labours have thus far been so interesting and successful; but he believes that possibly carbon bisulphide, and ammonium sulphate in minute quantities, with a liberal supply of carbon from the hydrocarbons, may afford the necessary diet. Information drawn from other sources helps to the understanding of the question; and extracts from the work of certain eminent bacteriologists, and of their recent researches, may later on be given in our pages.

In the light of the bacteriological phenomena, described by the various authors whose works are available up to the present time, the occurrence at Tudor Street is not anomalous; but on the other hand it is distinctly concordant. It is not, therefore, a surprise to learn that the explanation tendered by the Gaslight and Coke Company through their Chief Engineer, Mr. G. C. Trewby, to the Chief Gas Examiner, Lord Rayleigh, was accepted as satisfactory. Subsequently, the facts were communicated to the Departmental Committee of the Board of Trade, and were adduced as evidence why the present stringent test for sulphur compounds should be made a more reasonable one. We believe that congratulations to Mr. Taplay were forthcoming from those who, in their discharge of a public duty, were obliged to bring the infraction of the statute before the authorized tribunal; and we desire to add our own appreciation of the thorough manner in which he has dealt with an interesting and important matter of gas distribution and testing. As it is quite possible that inexplicable cases of sulphuretted hydrogen in gas supply may have occurred elsewhere, we shall later on give the data from acknowledged authorities already referred to that may help to fix the distinctive organism that is capable of living in coal gas and causing the pollution.

Other actions brought about by bacteria of the "iron" and "pigment" order, are of considerable technical importance to gas engineers; but detailed reference to these must be deferred.

The "Engineer" states that for the protection of an iron pipe, dipping it in liquid asphaltum, rather than coal tar and pitch, is advocated. The variety of asphaltum obtained as a by-product from the California oil-wells is cheap. A pipe thus coated was laid for conveying salt water, and after six years was found to be still bright, not having been attacked inside or out.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 756.)

Business on the Stock Exchange continues much restricted; but the tendency is good, owing chiefly to the easy tone of the Money Market. There has been a little more inquiry for gilt-edged stocks, and Consols at one time were as high as 88⅞ for the account and 88¾ for money; while the Transvaal and Irish loans and Indian sterling stocks were likewise better. The demand for these securities led dealers to think that investment business is broadening out, for there was also a little inquiry for English railway ordinary stocks. The demand, however, was not continuous; and dealings slackened off towards the end of the week in view of the mid-monthly settlement. Markets generally are in a sound condition; and brokers are now looking forward to the termination of the holidays, when it is hoped their clients will turn some attention to the Stock Markets. Many securities can now be picked up to yield the investor a good rate of interest. Among these are Gas Stocks, as shown by our Share List. In this market, a moderate business was done in Gaslight ordinary stock; but it was not of sufficient importance to cause an alteration in the quotation, which is 92-94. Dealings were, however, recorded as high as 93¾. The 4 per cent. preferred stock was likewise in demand, and rose one, to 107-110. All through the week there has been a little dealing in Gaslight ordinary, while other stocks were for the most part neglected. Among the other London Companies, South Metropolitan met with some inquiry. Business was done as high as 126; and in West Ham at 97. In the Provincial group, Liverpool United "A" is ½ up at 217-19, and Newcastle and Gateshead consolidated ¼, at 104½-105. The British Gaslight Company announce a dividend at the rate of 10 per cent. per annum for the half year ended June 30, which is the same distribution as for the previous six months. The shares have been dealt in at 39⅜. Among Foreign Gas undertakings, the shares of the River Plate and Buenos Ayres Companies have been in request at higher prices. Imperial Continental at 201¾, and Oriental at 143, have been inquired for.

The daily operations were extremely quiet all through the week; the most business being recorded in Gaslight ordinary stock between 92⅝ and 93¾. The price, however, remains unaltered; but the 4 per cent. preference is 1 up. On Tuesday, Buenos Ayres (New) were inquired for, and rose ¼, to 11-11¼; but Commercial debentures fell 1, to 84-86. There was very little doing on Wednesday; but Gaslight 4 per cent. preference was advanced 1, to 107-110, and River Plate ordinary ¼, to 11-11½.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Supply of Dublin—A Sensational Offer from Mr. Hammond—Further Controversy on the Question of Cost.

The electricity supply of Dublin is again to the front, through the expiration of the twelve months during which Mr. Robert Hammond was appointed to supervise the undertaking of the Corporation, for the purposes of extricating them from their difficulties, and to correct the constitutional weaknesses from which the concern was lamentably suffering. The twelve months ended on July 31; and Mr. Hammond has prepared a report (of about 2¾ newspaper columns in length) in which the "first person singular" bulks very largely, in which loud and raucous blasts are blown from the Hammond trumpet, and which concludes with quite a sensational and (with all deference to the man who made it) an unprofessional offer. Mr. Hammond claims that his work has been successful; that since the staff has settled down to their duties, there has not been a single cessation in the city lighting; that the new system of electrical distribution, wherein three-phase 5000-volt feeders with 50 periods are employed, instead of the old single-phase 2000-volt with 84 periods, has proved "simple, flexible, safe, reliable, and economical." This statement, to say the least, is comprehensive as to the good qualities of the new system employed. A large part of the report is taken up with trivial details as to what Mr. Hammond has done in reorganizing the staff, the administrative department, and consumers' records; and his modesty does not allow him to refuse to take credit for having systematized the purchase of supplies and re-arranged the general management of the undertaking. After these things, however, more interest is found. Some statistics are given to show the increase in consumers and the number of lamps month by month under the Hammond *régime*. On July 1, 1903, there were 350 consumers, with 35,791 lamps connected to the mains; and on July 1 this year there were 790 consumers, with 68,322 lamps connected. This is satisfactory progress; but, in considering Mr. Hammond's brightly-coloured prospects, the Corporation should take a note of what these figures actually show. They do reveal a substantial addition to the business; but they also throw light on the fact that the Corporation have already exhausted the richer veins of electrical business, and are now descending into those of poorer yield. By a couple of simple division sums, it is seen that, whereas a year ago the average lamp connections per consumer were 102·25, now they are only 86·50. Mr. Hammond does not stay to point this out. He goes on to claim

a great reduction in the cost of working in the past twelve months, notwithstanding that the period only embraces a full six months' working of the new Pigeon House works, and within the first six months 3¾ months' running of the old Fleet Street works, and 2¼ months of the new and old simultaneously. The average cost was 2·43d. per unit, as compared with 3·09d. for the previous twelve months. Reading the report, one might inadvertently be misled into thinking that this reduction in working costs was due more to the Hammond administration than to the fact that, for six months, the undertaking was working with the brand new plant at the Pigeon House station, instead of the old-fashioned plant at Fleet Street. Under such circumstances, a reduction in the costs is what one would naturally look for. However, Mr. Hammond is more convinced than ever as to the possibility of generating and delivering electrical energy in Dublin at a cost, exclusive of capital charges, of 1½d. per unit.

What we have termed the sensational part of the report hangs on this 1½d. per unit. Mr. Hammond's optimism is beautiful; and his altruistic pretensions are grand. Later on Dublin will not be doing justice to the saviour of their electricity undertaking if the authorities cannot find for him a corner in the city for a pedestal and statue to commemorate his achievements. He states his willingness to enter into an arrangement for taking control of the working operations and assuring the Council for seven years against a higher cost than 1½d. per unit; his remuneration for supervision and for his guarantee being the difference between the 1½d. per unit and the lowest figure at which he may be able to generate and distribute electricity. But Mr. Hammond himself puts a damper on this offer being seriously considered by stating that he can quite understand it may not commend itself to those who have formed the idea that the capital expenditure has been out of all proportion to the extent of the undertaking, and that, even if energy can be generated and distributed at 1½d. per unit, the interest and sinking-fund charges upon the present capital, and upon that which will be required from time to time as the business develops, will far exceed the profit on working, and leave a heavy annual deficit to be borne by the ratepayers. The first offer, it is abundantly clear, is only the stile to a second, in which Mr. Hammond suggests taking over the whole undertaking for a period of not less than fourteen years, and substantially guaranteeing to the Council for that time the annual charges upon the loans raised, or to be raised, for the purposes of the undertaking, with a provision as to the rates "which would certainly not be higher than those at present in force." The existing rates of charge are from 7d. to 2½d. per unit for lighting, and 7d. to 1d. for motive power. The obvious answer to Mr. Hammond is one which has already been put forward by the Chairman of the Corporation Lighting Committee, that, if it would pay Mr. Hammond, or his Syndicate, to work the undertaking from London, surely it will pay the Corporation to work it themselves. We shall look with interest to see what measure of respectful treatment Mr. Hammond's romantic proposal will receive in the Council Chamber.

We were promised in the "Ironmonger" a second instalment of the contribution by their "electrical expert" on "Electricity or Gas." This second instalment was to treat of comparative costs. But another number of our friendly contemporary has come, only to bring disappointment at finding that the "expert" is strangely silent. But he has another critic this week in the person of Mr. L'ce. Fletcher, the General Manager of the Welsbach Company, who takes the expert severely to task, in the columns of the "Ironmonger," on several points as we did last week. There is one part of Mr. Fletcher's letter which it is a pleasure to assist in circulating. It is becoming almost generally acknowledged by electricians that incandescent gas lighting is cheaper than electric lighting; but there are still some people who obstinately decline to recognize the fact. To the notice of these, the portion of Mr. Fletcher's letter referred to is commended. Time after time during the past eighteen months the Welsbach Company have offered to put the question of cost to practical test, by installing, free of charge, throughout a given house Welsbach-Kern burners and mantles, if a similar house is fitted up with incandescent electric lamps—the illuminating power to be equal throughout the twelve months, and to be subject to four independent expert tests during that period. If at the end of the year, the result does not prove that the Welsbach light, allowing for mantle renewals at full prices, has cost less than one-fourth of the electric lighting account for the competing house, the Welsbach Company will pay for the installation; if the contrary, the opponent is to pay for the Company's. The challenge has never yet been taken up; and we do not suppose the "Ironmonger's" electrical expert has any desire to waste (as he knows very well he would do) his money in any such way.

This reminds us that there are electricians who are adopting new tactics in connection with this question of the relative cost of incandescent gas and electricity for domestic lighting. The light-for-light basis has proved too much for them; and so in their frantic endeavours to show that electricity need not cost much more than gas, they are now going in for prescribing for consumers the quantity of light they shall have in their rooms. But it is not all men who love darkness rather than light; and he is a queer philosopher who tries to instil into men's minds that they should sit in comparative darkness at a cost greater than they can get four times the light for by another system. But that is the kind of thing that Mr. Percy Rosling, who attaches "M.S.E.E." to his name, has been preaching in the correspondence columns of the "Yorkshire Evening Post," in continuation, with Mr. A. E. Collett, of the controversy that has arisen over the question of "Electricity in the Cottage" at Leeds, and which we recently noticed in the "Memoranda." Mr. Rosling prescribes for a small sitting-room a 16-candle power incandescent electric lamp, costing 21s. per annum, against 12s. for an incandescent gas-light; and then for the kitchen he suggests that an 8-candle power lamp is quite sufficient, and the same for the hall—thus reducing the cost for electricity to 42s., against 36s. for gas. We should like to see Mr. Rosling or his servants contenting himself or themselves with "illumination" such as he thinks is good enough for cottagers. He labours under the misapprehension, which is strange for an "M.S.E.E.," that 12s. for gas, "being the cost of one burner only," cannot be reduced. It is too much to believe that Mr. Rosling really thinks an incandescent gas-burner of 60 to 70 candle power is the lowest unit that can be supplied. There are good incandescent gas-burners of very moderate size, the use of which costs only a few shillings a year, and from which a light much in excess of his 16-candle power electric light can be obtained. But Mr. Collett answers Mr. Rosling in a nutshell when, taking that gentleman's own figures, he says: "A 16-candle power electric light would cost for the year 21s., against 12s. for the 60-candle power gas-light—the electric light thus costing almost 50 per cent. more for 75 per cent. less light." And Mr. Rosling proclaims his belief that cottagers will regard this as getting value for money!

UNPROTECTED INVENTIONS AT EXHIBITIONS.

In view of the forthcoming Gas Exhibition at Earl's Court, the following paragraph from the "Ironmonger" may be of interest: "In connection with the prize of £150 which the promoters of the forthcoming Grocers' Exhibition are offering for the invention of a safety petroleum lamp to retail at eighteenpence, attention has been called to a point of considerable importance to inventors, which the Directors of this annual undertaking, in common with most other exhibition organizers, do not appear to make sufficiently plain to exhibitors. After duly setting forth the conditions of the competition, the prospectus of the Grocery Exhibition declares that 'the Board of Trade having granted a certificate under the Patents, Designs, and Trade Marks Acts, 1883, all inventions, &c., shown at this exhibition are provisionally protected.' The natural inference which the average exhibitor must draw from such a notification is that an inventor who shows a lamp at the exhibition in question is, without any further formality, trouble, or expense, fully protected against having his invention imitated. That, however, is not at all the case; for, in order to secure the desired temporary protection, the inventor-exhibitor must: (1) Notify the Comptroller of the Board of Trade on a prescribed form of his intention to exhibit; (2) pay the regulation fee of 10s.; and (3) make application for a patent before, or within six months from, the opening of the exhibition. How it comes about that exhibition organizers have hitherto almost invariably failed to give warning to intending exhibitors of unprotected inventions that, unless these formalities have been observed, the provisional protection held out is entirely illusory, we are unable to say; but now that attention has been called to the matter, it is to be hoped that no time will be lost in rectifying the oversight. It is quite likely that the promoters of an exhibition who could be proved to have misled an inventor by an assurance that his exhibit was safe against imitation in virtue of the Board of Trade certificate, might be held liable at law for any damage the inventor had suffered by too implicitly relying upon the unqualified statement in an exhibition catalogue."

Part IV. of the "Technological and Scientific Dictionary," which is being published by George Newnes, Limited, is of special interest to our readers from the fact that it extends from "Ele" to "Gla," and consequently takes in both electrical and gas matters. The Editors (Messrs. G. F. Goodchild, B.A., and C. F. Tweney) deal with "Gas Manufacture" under the heads of "Coal Gas," "Coal Tar," and "Ammoniacal or Gas Liquor;" and each subject is treated as fully as space will permit. The article on the "Gas-Engine" contains a brief reference to Mond gas as a fuel for motors of this class; and more is promised about it when it appears under its own letter. The information furnished appears to be well up to date.

Returns from abroad (published in one of the electrical papers as to the market for carbide of calcium indicate that lighting by acetylene gas has not shown sufficient growth to support the prices for carbide, nor to keep some of the producing concerns from entering into the state of dissolution. One important firm of merchants in Germany, it is reported, are now offering large carbide of calcium, of a quality fulfilling the requirements of the German Acetylen Verein at prices equivalent to from £11 10s. to £12 2s. per long ton, or from £10 12s. to £11 with allowance for returned drums. "These figures," remarks the paper referred to, "show how the price of calcium carbide has fallen in Germany since the last makers' syndicate was wound up."

GAS PURIFICATION BY AMMONIACAL LIQUOR.

By Thomas Holgate, F.C.S., M.Inst.C.E.

(*Concluded from p.* 661.)

General Financial Results.

Having compared, as far as practicable, the cost of purification of gas, it is now to be shown how far the general results of the undertaking using purified liquor are in accord with those of others for a similar period. The Provincial Company chosen for the standard is Sheffield, as the quality of gas made nearly corresponds with that at Halifax, and the favourable position of the Company in relation to the South Yorkshire coalfield, as well as its coke sales, makes its working results among the best in the country. There has been no water gas made there—coke not being a drug, but a valuable source of revenue; the average net price, after deducting expenses, being over 4s. per ton higher than at Halifax. This difference is equal to 2½d. per 1000 cubic feet of gas sold. Notwithstanding this, the average of eleven years' working shows that while 17·66-candle gas at Sheffield cost 16·66d. per 1000 cubic feet sold, in the same period 18·05-candle gas at Halifax cost 17·37d., or 0·943d. and 0·961d. per candle per 1000 cubic feet respectively.

As shown in Tables XV. and XVa, these are the total costs exclusive of capital charges. They represent the net coal *plus* working expenses, and are taken from "Field's Analysis." The Halifax figures include for the last three years a percentage of water gas, as well as a quantity of cannel hub. The former, when the price of oil was low, was for the purpose of replacing the latter, owing to the increasing cost of getting rid of the refuse and to the diminishing quality of the hub available. During those three years, the difference in cost per candle was nearly 0·1d. per 1000 cubic feet in favour of Sheffield; but taking the longer period, the costs per candle differ by 0·017d. only, or 0·018d. × 18·05 candles = 0·3d. per 1000 cubic feet—an insignificant amount. If the 2½d. per 1000 cubic feet due to the increased price of coke be placed against it, there remains 2d. per 1000 cubic feet sold to the credit of Halifax.

The comparison given in Table XV. shows that whatever difference existed between the costs in 1892 and 1893 in favour of Halifax as compared with the London Companies has been maintained, notwithstanding the fact that economy of enrichment has been obtained in the period under review in various ways, by the three Metropolitan gas undertakings. The average of the first two years is 1·049d. per candle per 1000 cubic feet for Halifax, as against 1·350d. for the average of the whole quantity of gas made by the three Companies. As a coal strike occurred in Yorkshire in 1893, this affects the comparison.

The average of the succeeding nine years for the three Companies showed that 16·36-candle gas cost 21·95d. or 1·342d. per candle; while for Halifax 18·04-candle gas cost 17·02d., or 0·942d. per candle—a difference of 0·4d. × 18·04d. candles = 7·216d. per 1000 cubic feet sold. This difference is against 18·06 × 0·301 = 5·598d. for the two years when purified liquor was not used—a net gain of 7·216d. − 5·598d. = 1·618d. per 1000 cubic feet sold. For one year's sales this is equal to 806,594,000 × 1·618d. = £5437. This figure includes the saving directly traceable to

Table XV.—*Cost of Making and Delivering Gas* (*Coal minus Residuals, plus Working Expenses*).

Year ended December 31.	Gaslight and Coke Company.		Commercial Company.		South Metropolitan Company.		Average of the Total of the Three Companies.		Halifax Corporation.			Below Average of London per Candle.
							Per 1000 C. Ft.	Per Candle per 1000 C. Ft.	Illuminating Power.	Per 1000 C. Ft.	Per Candle per 1000 C. Ft.	
	Ill. Power.	Decrease.	Ill. Power.	Decrease.	Ill. Power.	Decrease.	Decrease.	Decrease.		Decrease.	Decrease.	Decrease.
	Candles.	d.	Candles.	d.	Candles.	d.	Candles.	d.	Candles.	d.	d.	
1892	16·39	24·38	16·33	23·13	16·50	19·22	23·05	1·405	18·12	18·14	1·001	0·404
1893	16·33	22·54	16·39	20·35	16·40	17·70	21·19	1·294	18·01	Coal Strike 19·74	1·096	0·198
Average	16·36	23·46	16·36	21·74	16·45	18·46	22·12	1·350	18·06	18·94	1·049	0·301
1894	16·35	19·79	16·36	19·21	16·40	16·98	19·02	1·162	17·61	16·41	0·932	0·230
1895	16·38	21·22	16·30	20·37	16·40	18·33	20·39	1·246	17·51	15·26	0·871	0·375
1896	16·39	21·82	16·27	20·86	16·50	18·61	20·89	1·274	18·52	16·90	0·910	0·364
1897	16·45	22·35	16·30	21·25	16·50	19·30	21·44	1·306	18·45	15·63	0·847	0·459
1898	16·40	21·77	16·38	20·43	16·40	18·21	20·66	1·261	18·37	15·31	0·833	0·428
1899	16·43	21·57	16·40	20·61	16·50	18·04	20·47	1·247	17·62	14·85	0·843	0·404
1900	16·55	25·59	16·60	26·58	16·50	22·24	24·64	1·487	17·75	18·41	1·036	0·451
1901	16·48	30·06	16·60	26·06	15·96	22·37	27·32	1·671	18·49	22·63	1·224	0·447
1902	16·49	24·30	16·61	22·05	14·90	20·04	22·75	1·422	18·05	17·81	0·986	0·436
Nine years' total	147·92	208·47	147·82	197·42	146·06	174·12	197·58	12·076	162·37	153·21	8·482	3·594
Do., average.	16·43	23·16	16·42	21·94	16·23	19·35	21·95	1·342	18·04	17·02	0·942	0·400
Do., Do., per candle	..	1·41	..	1·34	..	1·19	..	1·342	..	..	0·942	0·400
Increases	0·07	..	0·06	0·20	..	0·89	..	..	..	..	..	Comparing the two periods.
Decreases	..	0·30	..	..	0·22	..	0·17	0·008	0·02	1·92	0·107	

Table XVa.

Year.	Sheffield Company.			Corporation of Halifax.			Net Price of Coke per Ton.			Net Receipts for Coke per 1000 Cubic Feet of Gas Sold.		
		Cost per 1000 C. Ft.	Per Candle.	Halifax per Candle	Lower than Sheffield per Candle.	Higher than Sheffield per Candle.	Sheffield.	Halifax.	Difference.	Sheffield.	Halifax.	Difference.
	Ill. Power	Decrease.	Decrease.	Decrease.	Decrease.	Decrease.				Decrease.	Decrease.	Decrease.
	Candles.	d.	d.	d.			s. d.	s. d.	s. d.	d.	d.	d.
1892	17·40	19·09	1·097	1·001	0·096	..	11 0	5 11	5 1	5·89	2·61	3·28
1893	17·88	20·21	1·130	1·096	0·034	..	10 10	8 0	2 10	5·77	3·96	1·81
1894	17·92	15·47	0·863	0·932	..	0·069	11 0	5 2	5 10	5·84	2·59	3·25
1895	18·12	16·61	0·917	0·871	0·046	..	8 9	4 10	3 11	4·65	2·22	2·43
1896	17·73	16·10	0·908	0·910	..	0·002	8 8	4 1	4 7	4·69	1·68	3·01
1897	17·77	14·83	0·835	0·847	..	0·012	9 7	5 0	4 7	5·36	2·32	3·04
1898	17·84	15·18	0·851	0·833	0·018	..	9 8	4 10	4 10	5·24	2·36	2·88
1899	17·50	14·44	0 825	0·843	..	0·018	10 7	6 7	4 0	5·83	3·91	1·92
1900	17·41	16·21	0·931	1·036	..	0·105	14 6	10 3	4 3	7·82	4·93	2·89
1901	17·34	19·40	1·119	1·224	..	0·105	11 0	7 8	3 4	6·03	2·87	3·16
1902	17·41	15·69	0·901	0·986	..	0·085	10 7	7 6	3 1	5·79	3·32	2·47
Eleven years' total	194·32	183·23	10·377	10·579	0·194	0·396	116 2	69 10	46 4	62·91	32·77	30·14
Do., average.	17·66	16·66	0·943	0 961	..	0·018	10 6½	6 4	4 2½	5·72	2·98	2·74

Note.—The figures given in these and the preceding tables are for the Halifax Gas-Works for the year ended the 31st of March succeeding the 31st of December, to which the London and Sheffield Companies refer.

the purification of gas by the use of purified liquor, which has been calculated as £1623 per annum. Of the balance, £3814, some portion is undoubtedly due to the indirect savings from the same cause; and how much will be considered in the next paragraph. In less than three years, the saving in the cost of purification of gas, as given above, amounted to a sum exceeding the cost of the scrubber and washer erected in 1896-7 at a cost of £2905, and also that of the plant for the making and cooling of purified liquor erected in 1892-3.

An inspection of Table XV. will show that, leaving out the illuminating power, which, upon the whole, has in the two periods remained relatively the same, the costs were for the latter period less than in the former to the extent of 0·30d. and 1·92d. for the Gaslight and Coke Company and the Halifax Corporation, while the reverse was the case to the extent of 0·20d. and 0·89d. for the Commercial and South Metropolitan Companies respectively. The average of the three Companies shows a reduction of 0·17d., leaving a difference in favour of Halifax 1·75d. In other words, the difference of 3·18d. per 1000 cubic feet which existed at the beginning had increased to 4·94d. at the end of the nine years, and to 4·93d. upon the average of the nine years. The South Metropolitan—the cheapest of the three—was at the beginning 0·48d. below Halifax, but at the end 2·23d. more, with a reduced illuminating power of 1·55 candles; and for the average of the nine years 2·33d. more, with a reduction of illuminating power of 0·22 candle.

Indirect Saving due to Revivified Liquor.

The cost of purification for the year ended March 31, 1900, was 0·294d. per 1000 cubic feet purified; and this involved the use of 2·92 lbs. of lime. This quantity, at 20s. 5d. per ton (inclusive of charges for removal, &c.), required to remove 1 per cent. of carbonic acid would be 2 lbs. = 0·22d. As the lime in practice was not entirely carbonated, it may reasonably be assumed that a percentage was used up by sulphuretted hydrogen—say, 0·21 per cent.; leaving 1·25 per cent. as the average amount of carbonic acid in the crude gas—thus $2·92 \div 2 = 1·46 - 0·21 = 1·25$. Analyses of the gas from cannel hub showed it to yield an average of 9 per cent. of carbonic acid, against 2 per cent. for ordinary coal and 2½ per cent. for cannel. The average of 15 per cent. of gas from hub would be $\frac{(15 \times 9) + (85 \times 2)}{100} = 3·05$; thus indicating the removal by washing of 1·8 per cent. of carbonic acid as the average for Nos. 1 and 2 sections of the works. This is a quantity more than equivalent to that present in the crude gas of the majority of gas-works, and the presence of such an exceptionally high percentage was only permissible by reason of the cost of the cannel hub, and the necessity for keeping down coke stocks. The average price of cannel hub delivered into the coal-stores was for 1892-3, 1900-1, and 1901-2 respectively, 5s. 11d., 7s., and 7s. 7d. per ton, against 9s. 4d., 10s. 11½d., and 11s. 11½d. per ton for ordinary coal. The average price of cannel was 9s. per ton higher than cannel hub. After reckoning upon a lower yield of gas, sulphate of ammonia and brimstone per ton carbonized, and for the increased relative cost of carbonizing wages, wear and tear, and interest on plant, as well as for the removal of refuse, there remained a saving which over a term of years averaged 2s. per ton of hub. The effect of 15 per cent. of this material was therefore $\frac{24 \times 15}{100} = 3·6$d. decrease per ton, or 0·4d. per 1000 cubic feet of gas sold.

At the commencement of the use of cannel hub, the quantity of gas and the percentage of carbonic acid given off were distinctly better than in later years; and when the cost of removing the hub refuse increased, the economy as compared with cannel had ceased to be substantial. Under these conditions, it was found that, with oil at 2½d. per gallon, it was slightly more economical to use carburetted water gas; but when the price of this commodity rose, the use of cannel hub to the extent of 7·79, 15·27, and 18·35 per cent. for the years 1901, 1902, and 1903 was employed alongside the carburetted water gas, the proportion of which is shown in Table XIII. (*ante*, p. 659); and the concurrence of these two sources of carbonic acid explains the slightly higher costs in purification for these three years. Nevertheless when these and the other circumstances previously mentioned are taken into account, the costs are not high.

Bearing in mind the difficulty of estimating, it may now be possible to allocate as follows the sum of £5437 already mentioned:—

		Per Annum.
Direct saving in cost of purification,	806,594,000 × 0·483d. .	= £1,623
Indirect saving due to class of cannel	806,594,000 × 0·400d. .	= 1,344
	0·883d.	= £2,967
Balance to improved working in general	806,594,000 × 0·735d. .	= 2,470
Gross saving relative to London Companies as standard . . .	806,594,000 × 1·618d. .	= £5,437

The substantial indirect economy of 0·4d. per 1000 cubic feet of gas sold (£1344 per annum) is one that depended upon the local conditions; but the general principle is of value under a diversity of circumstances, giving the gas manufacturer the power to select his raw materials and his methods of working.

The Effect of Carbonic Acid in Gas.

The effect of 1 per cent. of carbonic acid in 16-candle gas is to reduce the illuminating power half a candle when burnt in a No. 1 "London" argand burner, and 0·8 candle when consumed with a good flat-flame burner—equal to a loss of 3·2 and 5 per cent. respectively, or 0·768d. and 1·2d. per 1000 cubic feet upon gas sold at 2s. per 1000 cubic feet. The effect when used in an incandescent burner, or in stoves, gas-engines, &c., has not been accurately determined; but knowing the hindering of combustion that ensues, the high specific heat of carbonic acid, especially at high temperatures, and that the products of combustion are generally rejected at a high temperature, it may probably be safe to assume that in these calorimetric uses the loss will be not less than 2 per cent. per 1 per cent. of carbonic acid in the gas supplied. This is equal to $\frac{24\text{d.} \times 2}{100} = 0·48$d. per 1000 cubic feet. To effect the removal of 1 per cent. of carbonic acid by means of 2 lbs. of lime may cost 0·24d. (less or more, according to local conditions); but to do it by purified liquor will cost 0·024d.

The practice in some works of passing air through the oxide boxes to assist the abstraction of sulphuretted hydrogen may be avoided entirely, or its percentage largely diminished, by washing the gas with purified liquor. Each 1 per cent of nitrogen present in the finished gas lowers the value 0·54 that of carbonic acid already given, or 0·4d. and 0·65d. per 1000 cubic feet upon gas burnt in an argand or flat-flame burner respectively, and 0·26d. for calorimetric purposes.

Removal of Sulphocarbons.

In addition to the advantages of securing a gas containing a minimum of useless constituents—*e.g.*, carbon dioxide and nitrogen—the use of revivified ammoniacal liquor has the considerable advantage of facilitating the removal of the sulphocarbons. It is well-known that the cost of purification by those undertakings which are under restrictions as to sulphur is determined mainly by the carbonic acid in the gas at the inlet to the purifiers. Not only does this determine the lime and labour, but it fixes the degree of watchfulness that must be exercised by the gas engineer over the sulphide boxes. So that by removing the bulk of the carbonic acid by purified ammoniacal liquor, the problem of sulphocarbon purification is attacked fundamentally. The estimates of those engineers who are most experienced in this matter do not differ widely—placing the lime now required for purification from carbonic acid as three-fourths to four-fifths of that employed for both carbon dioxide and sulphur dioxide. That the three-fourths or four-fifths may be avoided, is the opinion of the writer; and, under these circumstances, the removal of the last traces of carbonic acid, of sulphuretted hydrogen, and the major part of the sulphocarbons, becomes a simple matter.

Removal of Hydrocyanic Acid.

The increasing practice of removing cyanogen renders it necessary to consider the question of ammonia purification in conjunction therewith. The methods in use fall into two groups, (*a*) those where ammonia is in large measure removed from the crude gas simultaneously with the cyanogen, at the outlet of the condensers—*e.g.*, Beckton, Bueb, and Chance's processes—and (*b*) those where the cyanogen is extracted after the removal of the ammonia, as, for example, Foulis's and Feld's processes. With the latter class, no difficulty is raised; and with the former two alternatives are open. The first aspect of the problem would be how to use the ammonia for the removal of cyanogen, and get it back for the purpose of the purification of the gas by ammoniacal liquor; while the second aspect would be how to use the smaller quantity of ammonia available after the larger quantity had been deemed inadmissible. The last-named alternative implies a more frequent purification of a smaller quantity of ammonia than has been reckoned upon in the preceding portions of these articles; but it presents no serious chemical or financial difficulty.

All the methods of cyanogen recovery now employed produce ferrocyanides or sulphocyanides in the first stage; the crude product being subsequently purified or converted into cyanide. It has been the aim of many of the best workers in this field to make cyanide by direct absorption of hydrocyanic acid from the coal gas; but hitherto the presence of excessive proportions of carbonic acid and sulphuretted hydrogen have hindered progress in this direction.

Conclusion.

In addition to the controlling influence in gas purification of carbonic acid gas already referred to, it ought to be mentioned that its effect upon illuminating power and standard methods of testing for the same should not be overlooked. Any method that claims to be at once accurate and to fairly assess the value of the gas distributed, ought to be such as will take into account the percentage of this gas that is present. It is hoped that it has now been shown that not only is gas purification by revivified liquor based upon sound principles, but also that it is a commercial success. The great advantage of gas undertakings and their engineers being free from burdensome restrictions may, in this department of their work, best be secured by utilizing to the full the agent within their reach. Such a course meets the difficulty and solves it upon the highest plane, as it gives to the consumer an article about which there can be no cavil, and it does so at a cost for purification a fraction of that now generally incurred.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

The One Hundred and Thirty-Ninth Quarterly Meeting of the Institution was held on Saturday at the Midland Hotel, Bradford. After luncheon, the business meeting took place.

The Hon. Secretary (Mr. H. Kendrick, of Stretford) read the minutes of the last meeting, and they were confirmed. He subsequently read a letter from Mr. James W. Helps (dated July 25) with reference to the forthcoming exhibition at Earl's Court, in which it was suggested that the various District Associations should arrange for a meeting of their members to be held during its progress, and to do all they could to make it a success.

Mr. Isaac Carr asked the nature of the business suggested. Was it to hold one of their ordinary meetings during the exhibition in London?

The Hon. Secretary: I take it that it is to hold an ordinary meeting.

The President (Mr. H. Townsend, of Wakefield): There has not been a meeting of the Committee since the letter was received; but I thought we could give it consideration to-day in order to make the exhibition a success. We in the Provinces may not have so keen an interest in it as those near London; but if it is made a success, it will certainly affect us in the Provinces. The Manchester District Institution should, I think, hold one of their meetings within the exhibition grounds; but there are, of course, difficulties in the way. Being so far away from London, we could not do it in a single day; it would take two days, or even more. Then, again, it would be difficult to devote our attention to business with so many distractions around us. The subject will be considered again before our next meeting; and for the present I may content myself by drawing your attention to the matter, and asking you to do all in your power to make the exhibition a success by getting your Boards of Directors or Committees to give as large contributions as they can to its funds, and when the proper time arrives to make it known so as to get as many visitors as possible.

Mr. W. T. Buckland (Chesterfield) said, as far as Derbyshire was concerned, he personally did not see why the members could not attend in London if they knew exactly when they would have to go there.

Mr. C. Wood (Bradford) said the Secretary had, he thought, rather misinterpreted the letter. It was not intended that the Institution should hold an ordinary business meeting, because (for one thing) there was no room in the exhibition available. The idea was for a meeting to be arranged for more in the nature of a holiday summer meeting. All the members would no doubt be in London some time during the exhibition; and it might surely be arranged for the Manchester members to be present all at the same time.

The matter was then left for further consideration by the Committee.

Remarks by the President.

Mr. Townsend said: We are about to visit the Bradford Exhibition. This exhibition abounds in points of interest; but the special feature which will be of most interest to us gas engineers is the splendid installation of the Keith high-power lighting in the exhibition grounds. This piece of lighting comes into direct competition with the electric arc lighting of the rest of the grounds, with the usual result that the electric light is completely outclassed. There is one novel and most important point about this piece of lighting; and that is that, by means of a delightfully simple and useful invention, the whole of the lamps can be instantaneously lighted or extinguished. As we all know, the principle of the Keith light consists of having the gas in contact with an incandescent mantle at a pressure increased to from 8 to 9 inches of water, instead of the ordinary 2 or 3 inches of the town's supply. This increased pressure displaces the mercury contained in a special governor, and allows the gas to pass to the burners. Upon the ordinary pressure being substituted, the mercury flows back, and cuts off the supply of gas to the burners—thus instantaneously effecting the lighting and extinguishing of the lamps.

I was much struck with the remark of a very prominent gentleman in Wakefield (for whose opinion I entertain the most profound respect) when I called upon him professionally a short time ago. Discussing the relative merits as illuminants of gas and electricity, he said: "Well, you must admit the superior 'nimbleness' of electricity." This quality of nimbleness seemed all-important to this gentleman. We all know that lookers on see most of the game; so perhaps this gentleman voiced the general feeling. If so, it behoves us to add "nimbleness" to the other advantages of gas lighting—such as cheapness and brilliance; and, in this new departure, we have a demonstration of nimbleness quite equal to anything possessed by the electric light.

We must, with this example before us, now devote our attention to the best means of achieving nimbleness in the lighting of public and private buildings; and then I think we shall have nothing to fear from the competition of the electric light.

I am personally much indebted to Mr. Wood, our esteemed colleague at Bradford, for the opportunity he has afforded the Institution of inspecting this novel and beautiful piece of lighting, and the trouble he has taken to prepare a description of it and to have the instantaneous lighting and extinguishing apparatus in operation for our inspection all the afternoon.

Keith Gas Lighting at the Bradford Exhibition.

Mr. Wood had prepared the following account of the lighting of the Exhibition: The concert hall promenade, which is 115 yards long and 14 yards wide, is illuminated by means of forty Keith high-pressure gas-lamps, each containing three 300-candle power burners. Thirty-six of the lamps are fixed in pairs, on ornamental standards, about 22 feet from the ground; and four others are suspended from the trees. A No. 4 Keith compressor is located in a small room beneath the concert hall. Near the top of each lamp standard is fixed a Keith patent automatic lighter. The body of this ingenious apparatus consists of a cast-iron casing fitted with a brass cap, attached to which are two steel dipping-tubes, the inner one being almost entirely closed at the bottom and being longer than the outer one. A quantity of mercury sufficient to cover the ends of both tubes is contained in the casing. The gas enters at a connection on the cap, and passes by ports into the annular space between the tubes just referred to. The normal pressure of gas, up to (say) 3 inches, is not sufficient to break the seal of mercury; but as soon as the high pressure is turned on, the gas breaks through the seal formed by the outer tube dipping into the mercury, and passes into the annular space between it and the outer casing, and from thence to the burners. As soon as pressure is established in the outer casing, the whole level of the mercury between the inner tube and the casing is lowered; and the mercury thus displaced passes into the inner tube, where there is only a very low pressure of gas. This gives an unrestricted passage for the main gas supply to the burners. The supply to the bye-passes, when the low pressure is on the mains, passes through a port to the inside of inner tube, and from thence to the bye-pass connection. The quantity of bye-pass gas passing under low pressure is regulated by a screw. When the high-pressure gas is turned on and the burners lit, if no provision was made, the bye-passes would be three or four times the size they were at low pressure. This difficulty is overcome by a valve, which is lifted by an ebonite float when the displaced mercury enters the inner tube.

Mr. Wood concluded: These automatic lighters have worked exceedingly well—in fact, we had not a single failure until some of the wooden brackets on which they are fixed got warped, which put them out of level. Of course, this would not occur where they are fixed on proper iron lamp-pillars. Except that we have broken a number of globes, the cost of maintenance has not been high. The mantles last from six to eight weeks. It would be better to use larger globes for outside lighting when three burners are fitted; but I think most of the breakages are due to the peculiar character of the lamp-standards, which were designed for artistic effect and not for economical lighting. The installation has given the greatest possible satisfaction to the Exhibition Committee, and has been a complete success in every way.

A hearty vote of thanks was accorded to Mr. Wood for his kindness in arranging for the installation to be inspected.

A Suggestion as to Future Meetings.

Mr. Tim Duxbury (Oldham) said he had often thought the Institution ought to have one meeting during the summer which lady friends could attend. This he believed would become popular; and he should like the Committee to deal with the subject. At the same time, they might consider whether it was now advisable to have four meetings a year. There was the one at the end of November which was always badly attended. It was a bad time of the year for gas engineers to leave their works, which was perhaps the cause of the small attendance.

Mr. W. W. Hutchinson (Barnsley) thought that ladies ought to be present on one occasion certainly out of four; but with regard to the suggestion about dispensing with the November meeting, he disagreed with that entirely.

The President said he would see that the subject was brought before the next meeting of the Committee. He was in sympathy with Mr. Duxbury's remarks. It had often struck him that four meetings in the year were too many for the Institution. It was expensive for the year's operations, and added vastly to the work of the President for the time being. Two pleasure meetings in a year were, he considered, too many for a technical Institution, and one would be ample. An alteration in dates might be worthy of consideration, and he would see that the matter was brought before the next meeting.

Mr. Duxbury said one matter seemed to have been misunderstood, which might convey a wrong impression. A suggestion had been made that four meetings a year were too many; but it was not with the idea of doing away with the November meeting that he mentioned the subject, but to have a meeting in the middle of October. What he thought should be dropped would be one of the summer meetings.

The proceedings then closed.

The party occupied the rest of the day in visiting the Bradford Exhibition, to inspect the Keith system of lighting and the other interesting things to be seen there.

WAVERLEY ASSOCIATION OF GAS MANAGERS.

HALF-YEARLY MEETING AT MELROSE.

The Eighty-Seventh Half-Yearly Meeting of the Waverley Association of Gas Managers was held in the George and Abbotsford Hotel, Melrose, on Thursday last. There was a very fair attendance of members, and on arriving a visit was paid to the gas-works. At the meeting Mr. J. GEMMEL, of Melrose, the President, occupied the chair.

WELCOME ON BEHALF OF THE GAS COMPANY.

Mr. F. R. N. CURLE, the Secretary of the Melrose Gas Company, said he understood that the Waverley was the oldest of all Gas Associations; and he was very proud, on behalf of the Gas Company, to welcome them there. He was only sorry that the weather was not such as would enable them to see Melrose to its fullest advantage. At present they in Melrose were doing their utmost to keep down the cost of gas, in order to meet their new rivals in the district. He did not think they had suffered very much from the onslaught; and he hoped that they would be able to hold their own.

PLACES OF MEETING NEXT YEAR.

Mr. J. M'LAREN (Duns) moved that the meeting of the Association in April next be held at North Berwick, and the meeting in September following at Loanhead.

Mr. H. RUTHERFORD (Aberlady) seconded, and the motion was agreed to.

ADDRESS BY THE PRESIDENT.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—I would like first to thank you for the honour you have done me in electing me as your President, and at the same time to welcome you all to the centre of the Waverley district.

In our small works, there is not much opportunity for carrying out experimental work. I propose to briefly describe to you the alterations which we have recently carried out, and shall be glad of any criticisms you may offer regarding these alterations or my methods of working.

At the entrance to our works, a 3-ton weighbridge is fixed; and all our material is here checked. The coal-stores are two in number. No. 1 store measures 24 feet by 22 feet by 11 feet to the eaves; and No. 2 store, 48 feet by 14 feet by 10 feet to the eaves. We can easily store 250 tons of coal; so that, even in the busy season (having room for eight weeks' stock), we are safe from strikes, breakdowns, &c., at the pits.

The retort-house is 25 feet by 23 feet by 14 feet high to the eaves. This is the original retort-house as first built; and at that time it was considered pretty large. However, we are contemplating, among other extensions, a new retort-house. The retort-bench was rebuilt five years ago on the generator system. We have nine retorts in all, in three ovens containing respectively four, three, and two retorts. The settings are very good and durable, and are easily worked. I clean the fires once in twenty-four hours. The bars of the furnaces are of angle-iron fixed at a slope; a trickle of water being kept constantly running on the bars, which helps combustion, and at the same time softens the clinker. In cleaning the fires, we draw the bars and allow any clinker to drop into the ash-pan. Meantime the fire is supported and bridged by the clinker, the bars are then run in, and the fire broken down—the fire resting on top of the angles. My system of working is four hours to each charge. I draw and charge (say) an oven of four in pairs. The coke from the right-hand top retort goes to the furnace; being conducted there by means of a shoot running on wheels, and thus readily fixed and easily taken away. The retort drawn, the shoot is removed and charging is commenced. The left-hand bottom retort is next taken, the coke from which is cooled in the ordinary way and goes to the coke-bin. I have found it a good plan to charge the retorts at right and left sides. This does not cool all the one side of the oven, as is the case when the retorts are charged on the same side, and so the heat is equalized.

Carbon is scarcely known with me. I have never any trouble with it. My plan, when starting a new setting, is to scrape the retorts every day till a smooth surface is got, and then to add a little common salt, which has the effect of enamelling the interior. I have found, after taking the carbon off a set of four retorts, that there was only such a quantity of carbon from each retort as an ordinary square shovel would take away.

The following were my results per ton of coal used as per consumers' meters (my Company not yet having a station-meter) for the year 1903: Gas sold, 7,325,000 cubic feet; coal used, 849 tons; yield and sold per ton per consumers' meters, 8626 cubic feet.

I have never, in all my experience, had or seen a choked ascension-pipe. I have always made it a point to have evenly and regularly charged retorts. All gas-passages are kept clear. Our ascension-pipes are 6 inches, tapering to 5 inches at the bridge-pipe. I work with an inch seal, thereby allowing the gas to get more freely away. By these evenly-charged retorts, I get a higher illuminating power and a better yield of gas per ton. The hydraulic main is U-shaped, 20 feet long by 18 inches by 18 inches, and is set on iron standards resting on the top of the retort-bench.

In an oven of four retorts, after working constantly for 19 months, the right top retort showed signs of giving way—this in the month of January, when I could ill-afford the letting down of this oven, owing to the demand for gas. As it was coming out in the summer, I was particularly anxious to get all the work out of it I could. At 6 p.m. I saw this retort charged; and it then showed signs of weakness. I again saw it at 10 p.m.; and, to my surprise, it had a hole in the side, near the combustion chamber, measuring about 3 feet long by 15 inches in its widest part, and tapering to a point—not a nice state of affairs at 10 p.m., when one is thinking of turning in. However, emergencies have to be met. It being necessary to maintain the make of gas, the other three retorts were kept going; this being the only set then working. I then opened out the front of the bench between the top retorts, and above the arches on which the top retorts are resting. I could see through the hole I made in the oven what was required. I got some flue covers, and lowered them into position by means of two iron bars. Having got the covers into position, I then got some 18-inch by 6-inch bevelled blocks, and placed them on the top of the covers with the bevel inwards towards the side of the retort. As each cover and block was put in, the iron rods used to place them in position became so hot that they had to be taken out and cooled. I managed to get the outside of the retort well patched. I then came to the inside of the retort, and ran in some cement and fire-clay, and so made good the break in the retort. I again built up the front of the oven; and up to the time of taking out the retort, it never troubled me; in fact, it became as strong as any part of the other retorts. It took four hours to complete this repair; and during all this time the other three retorts were kept hot and gas was being made in them.

To return to the description of the works. From the hydraulic main the gas passes through a foul main, 8 inches diameter, 53 feet long, to a tar and liquor separator. The gas next passes up through an 8-inch pipe to the condenser, which measures—box, 14 ft. 3 in. long by 3 feet broad, with twenty 8-inch by 9-feet bridged vertical pipes, giving in all 670 square feet of cooling surface, or 130 square feet per ton of coal per day maximum, which is ample. The outlet pipe is reduced to 6 inches, to suit a four-way valve which is in use with the scrubber and washer. The gas can either be sent through the scrubber and washer or bye-passed, at will. The dimensions of the scrubber, which is of Young's automatic type, are 10 feet high by 4 feet diameter. In my past experience, I have found great difficulty in running off all liquid when clearing. I have therefore bored a 1-inch hole, and have fixed a piece of 1-inch tube with a blind end at each clearing door, so that the blind end can be removed, and thereby all liquor in each cell can be run through each division, and the liquid get away at the bottom cell by the overflow. The connections from this point onwards are 8 inch.

The new purifying shed is 68 feet by 18 feet; and the lime-store, 30 feet by 18 feet, with three 12 feet by 12 feet by 5 ft. 7 in. deep purifiers. The boxes are sunk in the ground about 3 feet, and rest on three piers of 9-inch brick walls, 18 inches from the ground. All the connections are 8-inch; and 8-inch rack and pinion valves work the purifiers. They can be worked one on and two off, two on and one off, or three on. All the connections have blind-ends; so that in the event of chokes they can be easily removed and the pipe cleared. At the same time, access is got to any under part of the purifier for repairs, if necessary. The purifiers are charged with lime; each box having three tiers, from 12 inches to 15 inches deep.

The preparation of lime requires careful attention. My method is to slack the truck-load of lime as soon as it is delivered; turn it over; and then, when charging the purifier, make it so that it will be just so moist that it will ball in hand when pressed. I find this is as good a way as any. I have no trouble with hard-caked material in purifiers, nor yet, on the other hand, have I any trouble with its being too powdery; and at the same time I have no extra back-pressure. The refuse lime is sold to local farmers, who come and take it out of the purifiers. This obviates the strong and objectionable smells often heard of about a gas-works. The very much larger purifiers have had a good effect upon the purity and illuminating power of our gas, as we can remove all the carbonic acid and sulphuretted hydrogen, and, therefore, we get a better result than formerly with the same coal.

The covers of the purifiers weigh 35 cwt. each. To lift these, I have a run-way 2-ton block, running on 10-inch by 5-inch steel joists, which are fixed to cross-beams and run into the lime-shed wall at one end, and project 9 feet out over the tar-well, where the run-way is used for loading tar barrels. At the opposite end, it can be used for conveying the lime which we use for purifying purposes.

The outlet from the purifiers to the holders is 8 inches, and runs through No. 1 coal-store and joins the inlet to the holder, which is 6 inches.

I may here give a brief description of how I work my holders. The one inlet serves for all holders, three in number. In the case

of the holders on the right and left, the inlets and outlets are both open. In the largest holder, the inlet only is open; the outlet is always kept closed. The outlets of the first two are joined to the inlet of the governor. The inlet to No. 3 becomes also the outlet. In working, the heaviest holder empties first. When No. 1 gets empty, away comes No. 2; when it gets clear, away comes No. 3. In this way, many an awkward fix through the shifting of the wrong valve is obviated.

The capacity of the three holders is 20,000 cubic feet. Our maximum make is 50,000 cubic feet per day, or two-and-a-half times the storage. The complete scheme proposed includes the provision of a 70-feet holder to contain (say) 75,000 cubic feet.

The governor-house is 10 feet by 10 feet by 8 feet, and is provided with an 8-inch Cowan's water-loading governor.

The complete scheme of reconstruction includes, besides the gasholder for 75,000 cubic feet, a station-meter to pass 10,000 cubic feet per hour and an exhauster, steam-engine, and boiler of the same capacity.

Discussion.

Mr. A. Bell, sen. (Dalkeith), said he had had much pleasure in hearing the President's address; and he must congratulate him and the Melrose Gas Company upon going on the right lines in extending their works. They were certainly too cramped to give a satisfactory supply of gas, economically or otherwise. He had had the pleasure of seeing through the works that day; and he thought that, with the ground they had alongside, they might be made very satisfactory indeed. When the extensions were completed, the President would be able to work satisfactorily, and the Company would be able to hold their own with the electric light. He did not see that electricity was making much show in Melrose, any more than in Dalkeith; and he thought that now, with incandescent gas lighting, they had a strong hold upon artificial illumination, and that nothing could touch them in the meantime. The President made a remark about his hydraulic main, which he might take the opportunity of criticizing. The hydraulic main was supported by the bench. In building the next one, he would strongly advise him to have no support to his hydraulic main from the bench. Have it on the buckstays or anywhere else, but let the hydraulic main be supported independent of the bench altogether. The purifiers were certainly on correct lines. They had been, till quite recently, wrong altogether in their ideas as to purification, and had, in too many cases, hampered their work by insufficient plant. The purification of gas was a chemical process; it required time to secure efficiency. The larger the purifiers were, the better. They knew that in summer they got better purified gas, which was simply owing to the make being smaller, and the gas having longer time in which to go through. He must congratulate the President on getting the farmers to come and lift the lime. He himself had to go with hat in hand and beg them to take it away; so that the President was very well off in that respect. In the South of Scotland, there was no lime in the soil. The hills were Silurian, and contained no lime; and it was consequently necessary for the farmers to use lime in their work. In the Dalkeith district, they were upon the coal measures, and lime was not so much required by the farmers. They were also near Edinburgh, where they ground up the lime and sent it out, paying half the carriage, which he could not afford to do. He had come through the mill of reconstruction quite recently. He had had practically to renew his works. They had only a small bit of ground, and he had to build the new retorts striding over the top of the ordinary going plant as it were—the living gas-works; and it had been a terrible job. In the President's case, he was doing the work slowly, which was to be commended, because the doing of it otherwise added greatly to the expense. He was sure the Melrose Gas Company were doing the correct thing in putting up these works, because gas was still able to hold its own, not only in this country, but throughout the world. The electric light had no chance at all, as compared with gas; and there need be no fear in the putting up of new works. Panic was sometimes got up, and people had sacrificed their holdings in gas stocks; but he thought there was no need for fear. The President did not refer to his washer, which, he thought, was rather small, and should be brought up in proportion to the other plant. The works were going to be ample in other respects. When they were extending works, they should do it to meet the requirements of the next generation. He was glad to see that Melrose was growing; and he thought they should see to it that all their plant was in proportion.

Mr. D. Robertson (Dunoon), the Past-President of the North British Association of Gas Managers, expressed the pleasure he had in being there. The President had given them a most practical address, and one which suited their Association remarkably well. He had described his works to them, which was always interesting to gas managers. He thought a gas manager's first business, when going on holiday, was to visit the gas-works in the town he went to. They had carried out this plan at Melrose; and the works were satisfactory. At the same time, he was surprised that there was no station meter. He failed to see how any manager could work satisfactorily without a station meter; and he hoped that in the plans for the extension of the works, they would not forget to include one. The President was a very modest man; but he did not think that modesty should be allowed to hide its light under a bushel. He had given them an excellent address, containing one or two points which they could take to themselves, and apply to their own particular plant. He admired very much the plan for repairing the retort which broke down. It was only a man in the position of the President who could do that kind of thing, to the satisfaction of himself and his Company. An office man could not have done it. It required one who had had experience in the erection of works, and in working with his hands, to have carried out the repair in the admirable way in which the President did it. They knew what it was for retorts to break down in their busiest season. Though it might not stop the make of gas, it would put them to the greatest inconvenience to have to light up others. Probably the President saved himself a little trouble by doing what he did; but he also saved his Company ten times more trouble, and a great deal of unnecessary expense. Those were little things, which the directors of gas companies very often knew nothing about. They met their manager perhaps once a month, and found everything going on satisfactorily; but they did not know the manager's difficulties unless he told them, and managers usually preferred not to do so. If directors knew their manager was putting himself to such trouble, and saving them expense, as the President did in this case, he thought it should be taken notice of, and due credit given to him. The President had done excellently in this matter. Only a person who had charge of a works knew the trouble such operations entailed—the thought it required, as well as the practical work, to make the job a success. He would like to touch upon the feeding into the gasholders. Did he understand that two of the holders had the inlets and outlets open all the time, and that the inlet to the largest holder was open, but that there was no outlet?

The President said that was so.

Mr. Robertson believed that this system might have its advantages so far as the feeding of the town was concerned; but, in feeding into the largest holder of the three, he feared that they would be sending gas into the holder where they had the greatest back-pressure. He thought it would be an advantage to feed into the holder having as little back-pressure as possible.

The President: The back-pressure is only about 3 inches.

Mr. Robertson remarked that it was no doubt an advantage to a manager to know that in the darkest night he did not need to bother about valves—because there was always the possibility that even a most careful man might make a slip, which might produce the greatest inconvenience. The President's system would ensure that there would be a constant supply of gas.

Mr. H. O'Connor (Edinburgh) said there were one or two points which he might touch upon. The President said there was not much opportunity for carrying out experimental work in small places. This was becoming, in the present day, more and more untrue. In small works there were chances of making experiments which were not to be found in larger ones, because the manager had to see into the most minute matters; and he could test them with the simple apparatus which was to be obtained now. He noticed that, while the material coming into the works was carefully checked by means of the weighbridge, and so on, it was not so when it went out. The President said he had never seen a choked ascension-pipe in Melrose. He originally came from the South; and he thought gas managers in the South of England would be delighted if they could say the same thing, as they had sometimes as many choked ascension-pipes as one in a dozen. The President was therefore distinctly lucky in this respect. The repairing of the broken retort, as described by the President, must be very useful to every gas manager who had heard it, or who would read it in the technical papers afterwards. Details of such repairs were most useful to every practical man. He had, perhaps at a moment's notice, to make some repairs himself; and when he knew what had been done in other works, he was able to put himself in the place of the workmen, or to do himself what was necesary to put the matter right in the shortest time possible. He noticed that the President slaked the lime immediately on its receipt. This, of course, was a very good thing, provided there was not a large quantity of carbonic acid about the works, which would tend to foul the lime. Lime might be fouled even so far as a foot deep, if there was a considerable quantity of carbonic acid floating about the works. Consequently, slaking it immediately it arrived, if it had to stand for any time, might tend to its getting fouled. A plan which he had seen adopted was to only slake the lime two days before it was required, and to pass it, after it was slaked, through a large sieve, placed on a slope, and the lime thrown against it. This broke up the lumps, and insured the lime getting through; and if some of it should be too wet, it would wait upon the sieve until dry lime came to help it through. This ensured the lime getting into the proper consistency. He knew of a works where they had to use puddle clay to fill up the lutes of the purifiers; the purifiers being too small. This process of passing the lime through a sieve was tried; and it was satisfactory. He noticed that the President got his refuse lime sold to local farmers; but he did not tell them how much he obtained for it. He heard of a manager in Ireland who secured 4s. or 5s. a ton. He believed this was almost a record price; but it was only in October or November that he could get the best price; and he had to store it for a long time. At present, he was obtaining about 2s. 6d. a ton.

Mr. Bell: That is about the usual price in the South of Scotland.

Mr. O'Connor went on to say that they all knew the recognized

capacity of gasholders was about equal to one day's maximum make. The President was very far from this; but he was proposing to put up a larger holder, which would be, if anything, on the right side. Sir George Livesey had suggested that in putting up new holders they should always double the storage capacity; but he thought he meant the double of the holders, which would be equal to a day's consumption, so that a 75,000 cubic feet holder would not be on the right side. It was certainly true that now, when they had a large day consumption, the holder capacity could be smaller than in the old days, when gas had to be made every hour of the 24, and sold, perhaps, during three or four hours in the evening. In a number of works, they found that the day consumption was even greater than the night; so that it was possible to operate a gas-works with a smaller holder capacity than was the case formerly. He did not say for one moment that it was economical to do so; but it was possible. There was a works, not far from Edinburgh, where the capacity of the holders was only one-tenth of a day's consumption. He had been in the works a fair number of times; and he had never seen between the hours of nine in the morning and dusk, a single retort charged. They were always standing off, because the holders were full at nine in the morning; and the consequence was that they had to use three or four times the number of retorts to supply the gas required. It could be easily seen that the retorts, having to be kept hot from nine o'clock in the morning till dusk, cost a considerable sum of money; and therefore it was quite clear that to have plenty of holder room was a great advantage.

Mr. J. M'Gilchrist (Dumbarton) said it was nearly thirty years since he attended the first meeting of the Waverley Association in Melrose. He well remembered on that occasion they visited the works; and he could see there had been very great improvements made in the interval. It was pleasant to hear a Chairman like theirs telling an unvarnished tale. There was no statement in his address that he had been doing better than his predecessor. This was a very strong point in the President's favour; and even though he had no station meter, the quantity of gas he sold, as per the consumers meters, showed that his working was very good indeed. The President should be reckoned a handy man, when he repaired a retort under such peculiar conditions. A former Manager of the Melrose Gas-Works, Mr. Walter Hogg, was very clever at building in retorts; but he selected the time to put them right when there was no heat on them.

Mr. P. Blair (Haddington), like the former speakers, congratulated the President on his works, and also on his mode of working. They were about as good as they could expect them to be in a small place. With regard to the repairing of the retort, he might say he had done the same sort of work himself; but he generally built the furnace up with coke, and filled up the break with concrete. He had found this to stand as well as the former retort did. If, however, it were next the wall, he would require to take out the front of the building to get at it. He had two holders; and he worked them on the same principle as the President, by keeping the two inlets open. One holder was heavier than the other. Working as they did, there was no chance of the wrong valve being opened. He thought it the best way to work; and for all the extra pressure, where the holders were not telescoped, he did not think the back-pressure made much difference.

Mr. J. M'Laren (Duns) said that, being an old stoker in the Melrose Gas-Works, he could appreciate what he saw. There was only one thing he would pass a remark upon—that was the large price for waste lime which had been mentioned. In Duns, he used to get £13 a year for the whole of the waste lime. He had no bother whatever with it; the man came and took it away. He enlarged the purifiers; and after this the contractor thought he was not getting the same quantity of lime. Then he reduced the price to £11. He had 50 or 60 tons of lime in the year; the contractor obtained 5s. a ton for it.

Mr. J. Tulloch (Loanhead) remarked that carbon was a very difficult enemy to deal with. It had been a subject of discussion in the Association for a long time; and the man who could take only a shovelful off at the end of the season, working with a Siemens setting, was very lucky indeed. With regard to the broken retort, if the hole were so large as the President said, after the charge was put in, there must have been some negligence on the part of the man who charged it in not observing the defect; but the point was that the President had the capacity for filling it up. The President was to be congratulated upon having no choked pipes, because he did not think there was any other manager in the locality who had not to contend with this difficulty. He was also very lucky in getting the farmers to come and take the lime out of his purifiers, because he himself had to pay for the clearing of his purifiers, and for carting the lime away. He remembered when he used to get 6s. 3d. a ton for waste lime. He was only sorry they could not get the gas lime on to the land, because it was the best fertilizer that could be had; but there were so many artificial manures on the market that gas lime was being despised. Farmers were willing to buy sulphate of ammonia at £12 or £13 a ton; but they were ashamed to buy gas lime at 2s. 6d.

Mr. W. Young (Penicuik), the Hon. Secretary, complimented the President on getting free of carbon in his retorts. It was such a simple process that he was inclined to try it himself. There was one unsatisfactory feature—the want of a station meter. The President could not possibly give the returns per ton of coal from the consumers' meters, nor could he give an account of his leakage. As to ascension-pipes, he was about as good as the President. He did not think he had ever had a choked ascension-pipe. About six months ago, he had occasion to visit Melrose. The President was then just finishing his purifiers; and they were the best things he had there. He had purifiers which would deal with about three times the quantity of gas he was making. At Penicuik, he had four purifiers. He worked three of them with oxide and one with lime: and he had not had to empty a purifier during the last twelve months. It had not cost him 50s. for lime this year; and when he went to Penicuik, six years ago, it cost them £45 a year. No doubt oxide had cost him 50s.; but it would go on working for the next five years. He hoped the Directors of the Melrose Gas Company would go in for a complete system of reconstruction, and that they would not forget to put in a station meter. Until then, he did not see how the President could give the best results.

The President, in closing the discussion, thanked the members for the very hearty way in which they had received his address. In reference to what Mr. Young had said regarding carbon in the retorts, the putting in of salt was not the only thing he had to do—he would have to use a little elbow grease as well, to keep it down. With regard to the station meter, this was in the plan of reconstruction, and he was sure his Directors would be very pleased, when the time came, to supply the want. He held that the way in which they charged their retorts—seeing that everything was clear—was the reason they had no choked ascension-pipes. Mr. M'Laren was really very lucky indeed, in getting his lime disposed of as he did. He wished he could get as much there for it. Mr. Blair, of Haddington, had somewhat similar experiences as he had, in working his holders; and he was sure they would agree with him that it was a very good plan. Mr. M'Gilchrist said their results were very good. He thought they were, seeing that they had no exhauster, and about 8 miles of mains. Yet he would like to get better results, if possible. As to the repair of the retort, it was not often such a thing happened. But on that occasion it so happened the retorts were full up on the Sunday, and on Monday a slight leakage was noticed; and when it came to be repaired, the part fell away, and the whole thing required to be repaired under great difficulties. He assured Mr. Robertson that a station meter would be a great boon. At present, he was working in the dark, not knowing what gas he was making per ton of coal, and not knowing what gas he was losing, which was more important. Mr. Bell spoke of the hydraulic main resting upon the top of the retort-bench. As to that, the bench was built before he went to Melrose; otherwise it might have been different. He certainly would never construct a hydraulic main with its whole weight resting on the bench.

Mr. H. Rutherford (Aberlady) proposed a hearty vote of thanks to their esteemed President. He had given them a very excellent address; and they had had a very good discussion upon it. Being one of the oldest members of the Association, it gave him very great pleasure to be there that day, and to see some of their younger members coming forward and giving them their experience of what they were doing in the gas industry.

The President having acknowledged the vote,

Mr. M'Laren proposed a vote of thanks to the Hon. Secretary, without whom it would be a very poor Association. By the way in which he performed his duties, Mr. Young had brought the Association very much forward.

The Hon. Secretary acknowledged the vote, in a few words, and the meeting terminated.

The members and friends dined together in the hotel, Mr. Gemmel presiding. Mr. D. Robertson proposed the toast of "The Waverley Association," which was replied to by Mr. Alex. Bell, sen. Mr. James M'Gilchrist, in proposing "The Melrose Gas Company," mentioned that the Company charged for gas 3s. 9d. per 1000 cubic feet in summer and 4s. 2d. in winter, which he thought were very reasonable prices. Mr. J. Scott, one of the Directors, acknowledged the toast, giving some reminiscences of the Company.

The party then drove to Abbotsford, in conveyances provided by the Melrose Gas Company. In the historic mansion house the visitors were privileged, through an adventitious circumstance, to see, in addition to the many treasures which are shown to strangers, the desk standing open at which Sir Walter Scott wrote his great works. There were laid out books of reference, in language which no one present understood, the writing and blotting paper, with the pens, both quill and steel, which the great author had been using immediately prior to his death—the most pathetically personal of all the relics which the house contains. Of great interest to the visitors were the gas-fittings which Sir Walter Scott, who was closely associated with the gas industry in its early days, had fitted up in 1825, at the time when he started a gas-works for the lighting of his own place. The fittings by Messrs. James Milne and Son, of Edinburgh, are in perfect condition, and are in use to the present day. A large gasalier in the drawing room was particularly admired for its beautiful design, which is equal to anything produced in modern times, and its workmanship, which is superb; while the quality of the material is such that it has never required to be renovated or touched up in any way by a tradesman since the day it was first fitted. After eaving Abbotsford, the party drove to Galashiels, where it broke up.

THE MANAGEMENT OF RETORT-SETTINGS.

By Herr STEUERNAGEL, Manager of the Meerane Gas-Works.

[Abstract Translation from the "Journal fur Gasbeleuchtung."]

The fact that no part of a gas-works affects the profitable working of the undertaking more than the retort-settings is sufficient excuse for returning again and again to so oft-debated a topic as the present. The management of retort-settings falls under two headings: (1) The measures to be taken for producing most satisfactorily the temperature of carbonization, and (2) the measures to be taken for realizing the best value of the raw material, coal. In discussing these measures, it is intended to leave unnoticed particular apparatus and systems of settings as well as charging and discharging devices.

The greater the proportion of the coke burnt in the furnace which is completely consumed, the more heat is produced and carried to the setting in which the retorts lie. But it is high temperature rather than much heat which is required for carbonizing; and it must not be forgotten that heat and temperature are not synonymous terms. For instance, the same amount of heat affords only half as high a temperature if the quantity of the products of combustion is double what it should be. The quantity of the products of combustion, or chimney gases, is, however, dependent on the air admitted to the furnace; and the first problem, therefore, is to attain complete combustion with only so much air as is absolutely necessary for its consummation. The importance of this point is frequently under-rated; and, therefore, it may profitably be enlarged upon. The fuel, coke, contains 85 to 90 per cent. of carbon; but it is convenient in discussing these matters to regard it as carbon, and finally to make due allowance for the theoretical results so arrived at not being attainable in practice.

Now when the unit weight of coke—*i.e.*, carbon—is completely burnt, to form carbonic acid, 8080 units of heat (calories) are liberated, whether the quantity of air supplied is only so much as, or is much more than, is required. If the theoretical quantity of air is supplied, an initial temperature of about 2700° C. is attained; but if one-and-a-half times the theoretical quantity of air, about 1850° C.; if twice, only about 1400° C.; and so on. The percentage of carbonic acid in the products of combustion, or chimney gases, is a measure of the air supplied for complete combustion, and hence of the temperature attained. The chimney gases must contain 21 per cent. of carbonic acid when only the theoretical volume of air has been supplied, and the temperature of 2700° C. has therefore been attained. If the chimney gases on the other hand contain only the percentages of carbonic acid named below the temperatures attained will be about as stated:—

Percentage of carbonic acid . .	1	5	10	15	18	19
Temperature attained, degrees C.	141	694	1360	2005	2375	2500

But because the molecular admixture of the air and fuel does not proceed so rapidly as the combustion, it is impossible to effect combustion with the theoretically needed amount of air. Nevertheless, the foregoing considerations show the importance of reducing as far as possible the quantity of air admitted.

Producer settings present the possibility of utilizing the fuel in the most complete manner; but in practice they only achieve an economy of fuel when they are properly managed. Of the constituents of producer gas, only the carbonic oxide and hydrogen develop heat on combustion. Carbonic acid and nitrogen develop no heat, but by increasing the volume of the resulting chimney gases they distribute the liberated heat over a larger volume, and so prevent the attainment of high temperatures. As the carbonic acid—apart from that derived from the oxygen of the steam—is accompanied by $\frac{79}{21}$ times its volume of atmospheric nitrogen, it is important to avoid the production of needlessly much carbonic acid in the producer gas. This is best accomplished indirectly. No more secondary air should be supplied than is required for the complete combustion of the producer gas. The old rule was to open the secondary-air valve or slide until the bluish-green flame which indicates the presence of unconsumed carbonic oxide had just vanished. This rule would have answered well had it not been that, in practice, the producer gas varies in composition from time to time (according to the condition of the fuel in the producer) and so requires the supply of secondary air to be varied accordingly. The chimney draught being constant, if the secondary-air valve is set once and for all so as to admit the proper supply of secondary air for the average composition of the producer gas, the supply will be at one time too great and at another time too little, according to how long previously the producer had been clinkered. The supply of secondary air, however, depends also on the chimney draught, which also effects the inflow of the primary air to the producer. If, therefore, the producer is more or less choked, the inflow of primary air is restricted and the make of producer gas is reduced, while the pull of the chimney on the secondary air inlet is correspondingly increased. Hence the inflow of secondary air is greater, the less the make of producer gas. Consequently automatic regulators of the secondary air supply—such as that devised by Hudler—become indispensable. These devices, by curtailing the inflow of secondary air as the pull of the chimney increases, owing to reduction of the flow through the producer, have the effect of throwing an increased pull on the producer, and thus increasing the inflow of primary air and the make of gas. Always assuming the walls of the setting as sound, the effect is that uniformity of gas formation and air supply is attained.

A useful device for ascertaining whether the secondary air supply is properly set, is Pfeiffer's apparatus for determining the neutral zone. This consists of a glass vessel containing stick phosphorus. Chimney gas is aspirated through the apparatus; and if there is an excess of air, the white vapours of phosphoric acid are seen in the vessel. If they are observed, the secondary air should be reduced until the vapours are on the point of vanishing. With this apparatus, a large number of secondary air supplies can be rapidly tested and regulated.

The best means of controlling the working of the furnaces is, however, afforded by analysis of the chimney gases. It is easy to train the stage foreman to make such analyses with the Bunte burette or the Orsat apparatus, in works where special assistance is not available for the purpose. The sampling of chimney gas is commonly done by means of a rubber suction pump; but this is troublesome, and the author has preferred to instal a service of $\frac{1}{2}$-inch gas-pipe along the back of the bench, with pet-cocks at intervals to which burettes may be connected as required, and to maintain a slight vacuum in this pipe by a water-jet pump. Thus samples may rapidly be collected from any flue.

It has been said that the presence of over-much carbonic acid in the producer gas can be best avoided indirectly. Thus, when the secondary air supply is properly regulated, small quantities of heat afford high temperatures, and hence little coke needs to be burnt to supply the requisite heat. But as the coke burnt is proportional to the chimney draught, the latter must be kept slight. As a fact, the pull of the chimney upon the furnace is a most important factor in the proper working of a setting; and the problem is to work with the least possible draught. How small the draught may be, must be determined not merely for the particular type of setting, but for each setting individually, as each has its individual peculiarity in this respect. The brickwork of the settings is, unfortunately, never quite sound; and a strong draught causes much air to enter through the chinks. Such air—especially if it enters above the grate or the first zone of combustion—causes much loss in the producer, as it burns carbonic oxide to carbonic acid, and dilutes the producer gas with more nitrogen. More coke must in consequence be burnt to furnish the requisite heat; and for this the chimney draught has to be increased. There is thereupon further loss; so that the bad effect is cumulative.

It is sometimes observed that a proper heat cannot be obtained in the furnace, notwithstanding a large consumption of coke, while the producer becomes extremely hot. In accounting for this state of affairs, it must be remembered what are the conditions of formation of good producer gas. Immediately above the grate in a clean producer is the first zone of combustion, in which the coke is burnt to form carbonic acid, with liberation of much heat. In this way, the temperature attained is about 2700° C.; as there is not an excess of air present. The heat liberated is in large measure carried away by the carbonic acid into the deep overlying bed of coke, in which the carbonic acid is reduced to carbonic oxide, by means of which the heat liberated in the first zone of combustion in the producer is to a large extent conveyed to the furnace or setting, where it is utilized. Now for the reduction of carbonic acid to carbonic oxide a certain time, as well as a certain temperature, is essential. The time, however, depends on the rate of flow of the carbonic acid, which rate is conditioned by the cross section and depth of the bed of coke above the first zone of combustion in the producer. Now the depth diminishes as the coke is consumed, owing to the accumulation of ash and clinker; and by degrees the carbonic acid has too short a passage, so that the high temperature developed in the zone of combustion is not transposed into carbonic oxide. The producer becomes over-hot; and the ashes fuse to clinker, which sets on the sides, and reduces the cross section of the producer. This increases the rate of flow of the carbonic acid through the fuel, and diminishes the opportunity for its reduction to carbonic oxide. The producer gas consequently continually gets worse in quality; the setting suffers; and the producer is always getting hotter. It becomes necessary to clean the fire more frequently, and a whole train of evils ensues—with which gas engineers are only too familiar. In a word, the better the admission of secondary air is controlled, the higher will be the temperature in the setting; the less amount of heat will have to be supplied to the setting, the less coke will need to be consumed, the less need be the draught, the better will be the producer gas, and the less frequently will the producer require clinkering.

A feeble chimney draught favours the development of heat in the furnace chamber, and its transference to the retorts. It also tends to reduce the difference of pressure within and outside the retorts, and so to diminish loss of gas through the walls of the retorts. It is essential to have a good indicator of the draught—attached, for choice, to the primary-air inlet.

It is important to have proper control of the air passages, and to bear in mind that, as the escaping spent gases cool, they become denser and sink, while the air, as it becomes warmer, gets lighter. Economical working demands soundness of the air-passages. The amount of steam admitted should also be properly restricted. The temperatures should be determined, as they are of the utmost importance. Le Chatelier's pyrometer is well known as a suitable instrument for the purpose. The

author can most strongly recommend a more recent introduction, known as the "Wanner pyrometer," which is suitable for measuring temperatures exceeding 900°C.

The author prefers to put large charges into the retorts at intervals of six hours, rather than small charges every four hours. The cooling of the retorts and the loss of time by charging are thereby lessened, while the gas evolved remains for a shorter period subject to the action of the heated walls of the retort, and so undergoes less decomposition. The quality of the gas does not suffer from the longer period of carbonization, while the quality of the coke is improved by the thorough exhaustion it undergoes. In consequence of the more rapid removal of the gas from the retorts, stoppages of the ascension pipes occur less frequently, and less gas is therefore lost while they are being cleared. When it is further thought desirable to employ steam to prevent these stoppages, it is better to vaporize water from a vessel in the mouthpiece than to drop water in at the upper end of the ascension pipe, as it is difficult to supply enough (yet not too much) by the latter method. The water vapour carries heat with it into the upper part of the ascension pipe, and into the condenser, and thus prevents too rapid condensation of the gas.

Much more might be added to these remarks on the management of retort-house settings, but they embody the gist of the author's rather limited experiences.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

International Gas Exhibition.

SIR,—Some time ago a circular-letter was addressed (under cover to the Secretary) to the Chairman of every gas undertaking in the United Kingdom, explaining the objects of the forthcoming Gas Exhibition, and asking for contributions towards a fund to defray the expenses of "such features of the exhibition as will be of more benefit to the gas industry generally than remunerative to individual exhibitors." A very fair response has so far been given to the appeal. I have, however, received letters from the officials of several Companies, stating that copies of the circular have not yet been received by them. It is, therefore, possible either that certain of the communications have been miscarried or, through neglect, the names of some Companies were omitted from the list. If the Secretary or Manager of any Company who has not received a copy will kindly notify me of the fact, I shall be very glad to rectify the omission.

Will you also allow me to add that it is the intention of the Committee to forward, at an early date, to all Gas Companies particulars of the terms upon which cheap tickets of admission to the exhibition will be supplied, as it is hoped that many undertakings may consider it advisable to distribute them free among their customers.

Croydon, Sept. 8, 1904. J. W. HELPS.
Chairman of the Advisory Committee.

LEGAL INTELLIGENCE.

DAMAGE CAUSED BY SUBSIDENCE OF A ROAD.

A case was recently heard in the Bournemouth County Court, by his Honour Judge Philbrick, K.C., in which Mr. Arthur Upward, a cab proprietor, of Wheaton Road, Pokesdown, sued the Bournemouth Gas and Water Company to recover £15 for damage caused to a horse and carriage as the result of the alleged negligence of their servants in not properly filling in a trench which they had dug in a road. In July last, two new houses situated in Wheaton Road were connected with the water-main; and on the following day plaintiff's horse and cab sank into the filled-in trench. The defence was that the accident did not take place on any part of the road which had been opened up by the Company; or, if it did, that everything reasonable had been done in the matter of filling up the trenches.

Plaintiff said that on the morning of the accident he watched the cab go out of the yard; and just afterwards, hearing a call for help, he went out and found the horse down. The cab had sunk in a hole in the road, and one of the shafts was smashed. The horse had both its knees broken, and was unfit for use for a fortnight. In consequence of the accident, its value had decreased by from £8 to £10. The driver admitted that on the previous night there was heavy rain; and, in reply to his Honour, he stated that there were marks of a trench right across the road. A police constable who was called to the scene of the occurrence, gave evidence to the effect that the subsidence was about 3 feet from the centre of the road. There were marks of a recently dug trench; and the filling in was 2 or 3 inches above the level of the road. The wheels had not sunk in the trench made for laying the sewer (as was suggested by the Company in a letter written to the plaintiff). Considering the state in which it was, he did not think the road was fit for traffic. The Corporation road foreman said the sewer referred to ran down the centre of the road; while the water-main was about 5 feet away. The road was a private one, not repairable by the Corporation; but he was notified of the subsidence, and went to see whether it was in any way connected with the sewer. One of the wheels of the cab had sunk to the depth of 4 or 5 inches in a hole in the road, caused by a trench which had not been properly filled in. All the material that had been taken out had not been replaced; and there had not been sufficient ramming. There was another hole in the trench about 2 ft. 6 in. deep.

For the defendants, Mr. Trevanion said that two short trenches were made, leaving the centre for a width of 8 feet undisturbed; and he contended that the accident did not take place on any part that had been so opened up. An inspector in the employ of the Company stated that he visited the spot on the day after the occurrence. He noticed a subsidence about a foot from the centre of the road. On one side the water-pipe trench extended 7 feet towards the centre of the road, the width of which was 22 feet; and on the other it was 6 feet long. There was thus a large part of the road, in the middle, undisturbed. The foreman in charge of the work of making the connections said the trench was filled in, and the material rammed down, so as, in his opinion, to be safe for all ordinary purposes. Another of the Company's officials testified that, soon after the accident, he saw a subsidence nearly in the centre of the road, in a line with the sewer.

His Honour remarked that he must come to the conclusion that the earth had not been properly rammed, and that this was the cause of the accident. He gave judgment for the plaintiff for £13—£10 for depreciation of the horse, £2 for the loss of its services, and £1 for damage to the cab.

MISCELLANEOUS NEWS.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Ninety-Ninth Ordinary General Meeting of this Company was held last Tuesday at the Cutlers' Hall—Sir FREDERICK THORPE MAPPIN, Bart, M.P., in the chair.

The GENERAL MANAGER AND SECRETARY (Mr. Hanbury Thomas) having read the notice convening the meeting,

The CHAIRMAN, in his opening remarks, made a brief allusion to the death of Sir Henry Stephenson—as reported in the "JOURNAL" for Aug. 30. Proceeding to refer to the Company's position, Sir Frederick said that after an examination of the report and accounts the shareholders would agree with him that the half year had been most satisfactory in every way. The profit made during the six months had been £46,594; and after paying dividends, £43,424, and interest on debentures, £1000, it left them with a balance in hand of £2170 gained during last half year. The reserve fund was full, as they knew—the amount being £86,848; and they had a considerable balance in hand. They must bear in mind that the price of gas for the first three months was 4d. less than in the corresponding period of last year; and in the second three months it was 2d. less than the corresponding period of last year. This had affected their receipts for gas for the half year by making them less by £15,827 than they were in the same period of 1903. The quality of gas had been maintained. They had had 1151 tests made; and the average had shown 17·37-candle power, against 17·35 candles the previous half year. The prices charged had been 1s. 8d., 1s. 6d., and 1s. 4d. per 1000 cubic feet. Therefore, he said, with every confidence, the city had been well served with an excellent quality of gas and at as low a rate as any in the kingdom. The tests—that was, some of them—were made by officials of the Sheffield Corporation. In making the profit they had done, of £46,594, they paid £5561 less for coal, £7089 less for repairs of works, £2111 less for rates and taxes (income tax), and received £920 more for coke and £970 more for tar. On the other side of the account, they paid more for stokers' wages, £468; repairs of mains, £1879; for renewing and refixing meters, £705; for their donation to University College, £1000; and they received £15,827 less for gas. They had sold 1,336,440,000 cubic feet of gas, against 1,316,715,000 cubic feet in 1903—an increase of 19,725,000 cubic feet, equal to 1·49 per cent. The leakage during the half year had been 91,215 000 cubic feet, as against 85,111,000 cubic feet in 1903. The gas made per ton of coal had been 10,422 cubic feet, against 10,405 feet last year. Additional gas-engines to the number of 24 had been fixed during the half year, from ½-horse power to 130-horse power—not by the Company, but by independent people. The total quantity of gas sold for engines was 225,466,000 cubic feet during the last twelve months. Continuing, Sir Frederick said they had not fixed so many incandescent gas-burners as he expected they would have had to fix. The number was 5887 for the last six months. But large numbers had been sold in the city by other firms; so that the people were fully appreciating the advantages of using incandescent gas. Bristol had been making exhaustive experiments with incandescent gas-burners; and the Sanitary Committee had recommended that all new gas-lamps in their streets should have incandescent fittings, so that they would consume 4 cubic feet of gas per hour instead of 5 feet as with the old flat-flame burners for a year of 3978 hours; the lighting power being increased from 16 candles to 70 candles per hour. At the Tunbridge Wells Town Council meeting on May 31 the Mayor said that they had spent £80,000 for electric lighting, and they were losing a great many customers, who were adopting incandescent gas lighting. The Engineer's report stated that they had lost £800 of revenue by customers going back to gas. The College of Preceptors, Bloomsbury Square, London, considered the question of substituting electricity for gas for lighting the college buildings; but after careful consideration it was decided that incandescent gas fittings should be adopted throughout the building—a very wise decision, in his opinion. The Shoreditch Borough Council were obtaining the cost of incandescent lighting all over the borough; and it was estimated that the cost for gas, maintenance of mantles, lighting, extinguishing, painting, and cleaning would would not exceed the present cost, while the increased illumination would be very great—from 16 to 60 candles. In their present mode of lighting, it was clear that Sheffield was not behind other cities in lighting its streets, although they had a large number of lamps to alter from the flat flame to the incandescent. Mr. Thomas told him that there were now 3656 still to be changed. The Borough Council of Kensington considered it desirable to light part of the Harrow Road by electric arc lamps. Their Engineer, reporting on it, informed them that it would cost seven times the present annual charge for lighting; and they, therefore, declined it. The other day the chairman of a large gas company said at their half-yearly meeting that he had been for some

23 years in the position, and during that time the consumption of gas had risen from 2220 million cubic feet to 4003 millions—an increase of 80 per cent. The same chairman said that in 1881 their price was 3s. 1d. per 1000 cubic feet; while last year it was 2s. 8d.—a reduction of 14 per cent. He was struck by this statement; and he had thought he would refer to the Sheffield Company. The consumption of gas in Sheffield 23 years ago was 1131 million cubic feet, and in 1903 it was 2718 millions—an increase of 140 per cent. Taking the price on the same lines, the price of Sheffield gas was 2s. 4d. per 1000 cubic feet in 1881 and was now 1s. 8d.—which was equal to a reduction of 28·5 per cent. During the past half year the Sheffield Gas Company had sold 274 million cubic feet of gas at 1s. 4d. per 1000, 172 millions at 1s. 6d., and 874 millions at 1s. 8d. He said that if Sheffield was able to sell gas at these prices with a standard of 16·50-candle power, tested by the officials of the Corporation, and in addition supplied no water gas, he thought that the people of the locality were well served. The City of London's main thoroughfares were lighted by 508 arc electric lamps, for which they paid £26 each per year. If they had incandescent lamps, they would only have cost £3 8s. 2d.; and if they had four-burner incandescent lamps (as in Sheffield), they would cost £13 12s. 8d. So that he thought Sheffield was adopting a wise course in putting at the corners of the streets incandescent lamps with four burners rather than using the electric light. Mr. Thomas told him that in Sheffield the cost for gas would only be 19s. 11d. per light; and four times that would show a very large difference. He thought it surprising that in England people were not so ready to adopt these new kinds of lighting as on the Continent, where incandescent gas lighting had practically usurped the place of the flat flame burner; mantles being used with 90 per cent. of the gas supplied for lighting requirements. There was also a great difference in some towns in the number of cooking stoves used. In some places they were equal to 60 per cent. of the users of gas, whereas in other towns they did not go beyond 2 per cent. of the users of gas. He had been struck with a remark made the other day by Mr. Thompson, the Engineer of the Melbourne Gas Company. He said he had visited many places in England where building operations were in progress, and he found that no gas-pipes were being put in—only the electric light being installed. People who would permit this would find that they would have to put gas-fittings in even if they had gone to the expense of electric lights, and architects and builders would soon find that they had made a big mistake. Continuing, Sir Frederick said that on Thursday, the 21st ult., the Ormskirk Board of Guardians proposed to spend £4750 upon lighting the workhouse with electricity, at a cost of 4d. per unit. Mr. Wood, of Southport, said that the gas account for the last year was £225, and they had got 20 lights with incandescent burners. If they had had incandescent burners throughout, they would have had a much better light and have paid less for it. He considered the proposal extravagant. Men who were elected Guardians and spent the ratepayers' money in this way were very blamable. The Southport Conservative and Liberal Clubs had put in electric light installations, and they were now going back to gas. Another gentleman present thought the gas was right, and that this was not the time to add to their debts, already amounting to £17,000 or £18,000. The matter was postponed for further consideration. At Hastings, the Local Government Board had held an inquiry at which Mr. H. Carter said that for four years there had been a deficiency of £5467 caused by the electric light works. Though £40 per year was charged in the rates for electric arc lamps, in place of £22 to £25 for other towns, they had this deficiency; and one gentleman remarked that it was caused by selling electric current at too low a rate, and paying too much for the undertaking originally. Giving another instance, he said that West Ham, a very poor place, had spent £268,511 on an electric light undertaking. Their income for the past twelve months was £30,363, and their expenditure exceeded this by £3788. It was resolved that the deficiency should be made up out of the rates. In conclusion, Sir Frederick said that he had been used to referring to the complaints they had about naphthalene. They had tried very hard to overcome this, and they were now trying a process which last month reduced the number of complaints in another town to 19, as against 2753 in August, 1903. What result it would have in Sheffield, it was too early to say; but they were very sanguine that something would come of it. The gasholder they were building at Neepsend would be a great help to them when it was done. They had been fortunate in obtaining very favourable contracts, which were in good hands. He moved the adoption of the report.

Mr. EBENEZER HALL seconded, and the motion was carried.

On the motion of the CHAIRMAN, seconded by Mr. T. H. WATERHOUSE, the dividend as stated in the report was declared.

Sir F. T. Mappin, Dr. Sorby, and Mr. T. H. Waterhouse were re-elected Directors.

Mr. RICHARDSON moved a vote of thanks to the Chairman for performing his duties so faithfully during the past year. The motion, he said, was not merely a matter of form; they were all pleased to see Sir Frederick in good health, notwithstanding the number of years he had served the Company.

Mr. SIDNEY SMITH seconded, and asked if the Directors had under consideration any plan to adopt anything like the system of the South Metropolitan Gas Company, which gave its workmen an interest in the Company both as shareholders and by a percentage of the profits. It seemed to have worked very successfully, as the South Metropolitan Company were doing better now than ever before.

Sir F. T. MAPPIN, in reply, said he was sure, if they allowed him to add his colleagues as well, he could return them his sincerest thanks for the compliment they had paid to them and to the officials of the Company. He believed they had done their duty, and they were gratified to think that they were so well served as they had been for so many years. Answering Mr. Smith's question, he said that the matter had not been considered, as it was not a system which prevailed in the locality, or if it did, it was not in his experience. It was, perhaps, very successful with the South Metropolitan Company; but to introduce it into a locality where such an exceptional mode of dealing with the people employed was not known, would require very grave consideration before it was adopted. He must therefore see what his colleagues would do upon the subject before he could say anything more.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Increased Business at Dover.

An increase of 5 per cent. in the sales of gas over those of the corresponding half of 1903 was the gratifying announcement made by Mr. Willsher Mannering, the Chairman of the Dover Gas Company, at the half-yearly meeting last week. He added that the quantity of gas sold was 117,450,400 feet, as against 111,735,400 feet, or an increase of 5,715,000 cubic feet. The number of consumers had increased by 261—namely, 243 prepayment and 18 ordinary—the total number being 5926, of whom 3166 were prepayment consumers. In addition, 288 additional stoves were fixed, bringing the number on hire up to 4657. With reference to the accounts, as compared with the corresponding half the revenue showed an increase in gas-rental of £839, in meter and stove rentals of £73, and in residuals of £184—making a total increased revenue of £1097. On the debit side, manufacture showed a decrease in cost of coal of £34. A larger quantity by 532 tons was used; but the price paid was 10¾d. per ton less. Wages were £59 more, and repairs and maintenance of works and plant £283 more. This increased expenditure was incurred in the reconstruction of the roof of the oxide shed. Repairs, maintenance, and renewals of mains and services were £431 more, the wear and tear having been considerably heavier; and repairing, refixing, and renewing meters, &c., £517 more. The latter item included the amount written off for depreciation of automatic supplies, which was more than in the corresponding half year, and mainly accounted for the increase. Rates and taxes were £38 more, and maintenance of public lamps £84 more. There were 1031 lamps to be maintained, as against 1000 a year ago. There was a total increased expenditure of £1400. The revenue for the half year was £24,755, and the expenditure £20,496. The profit balance carried to profit and loss account was therefore £4259 To this had been added £130 for rent and interest on investments of reserve fund; and after deducting interest on loans amounting to £714, there was a net profit of £3675—sufficient to pay the full statutory dividend, and leave £284 to be added to the surplus balance of £1560 brought forward from the previous accounts. He concluded by remarking that the officers, staff, and workmen continued to discharge their duties very efficiently and faithfully, all working together with zeal and earnestness, solicitous for the prosperity of the undertaking. The report was adopted; and the statutory dividend at the rate of 7½ per cent., less income-tax, was declared on the stock and shares.

A Large Increase at Enfield.

The report submitted to the recent half-yearly meeting of the Enfield Gas Company stated that the gas sold had increased by 8,045,000 cubic feet, or 13·42 per cent. since the corresponding period of the previous year. The profit, after providing for interest charges, amounted to £3474, which admitted the payment of dividends at the rate of 5 per cent. per annum on the consolidated preference stock and 5½ per cent. per annum on the consolidated ordinary stock, less income-tax, and the addition of £300 to the undivided profit, increasing that fund to £2727. In moving the usual formal resolution, the Chairman (Col. Sir Alfred Somerset, K.C.B.) pointed out that the sales of gas had increased very considerably since June, 1903. In fact, the rate of increase was, with one exception, the highest that they had experienced in any corresponding period for many years. The Company supplied 802 more consumers and 25 more public lamps than at the same time last year; and there were 723 more prepayment meters and 789 more cookers in use. During the period when this growth had been taking place, £6800 had been charged to the capital account for additional main, services, meters, and cookers, £1103 for additional lamps, and £677 for extensions at the works—a total of £8580, £5020 of which appeared in the accounts presented in February, and the remaining £3560 in those before the meeting. To provide for expenditure, additional capital had been raised to the extent of £13,885. With each issue of capital, they had increased the number of consumer proprietors. With such a comparatively large addition to the capital, they would, naturally, wish to learn how the capital raised as a whole now stood in relation to the business done, and whether the relative reduction which had been a prominent feature for many years past had, for the time being, been checked or not. It afforded him gratification to be able to inform them that progress in the matter had not been stayed. At this time last year, they were employing £978 of capital per million cubic feet of gas sold, whereas now they employed £959; while, if they compared the increased gas sold in the last twelve months with the capital expended during the same time, it would be found that barely £619 of capital was expended for each million cubic feet of increased sales.

A Large Profit at Sunderland.

The total revenue of the Sunderland Gas Company for the year ending June 30 was £120,913, and the expenditure £102,599; leaving a balance of profit on the year's working of £18,314. The recent installation of stoking machinery has proved so satisfactory that the Directors are now considering the propriety of making further alterations in this direction. During the twelve months, 3381 prepayment meters were fixed, and numerous applications continue to be received daily. Gas and meter rentals amounted to £83,472, as compared with £81,022 in the previous year; while residuals realized £37,407, as against £35,902. On the other side of the account, wages cost £25,358, compared with £26,208; coal, lime, &c., £46,982, against £48,191; and repairs of works, mains, and meters £21,022, against £18,964. Including the amount brought forward from the previous year, there was a balance of £46,895 on revenue account. In moving the adoption at the annual meeting last week of the report and balance-sheet setting forth these facts and figures, the Chairman (Mr. G. R. Booth) said their two chief competitors were electric light and the paraffin lamp. The former they had been able successfully to meet, owing to the invention of the incandescent burner; while they were holding their own with the latter through the introduction of the penny-in-the-slot meter. Their large profit last year had been due to the lower price of coal and the increased sum received for residuals; but they must not expect so

much from the latter in the current year. Mr. Austin, in seconding, said they had not a ratepayers' purse to stand the brunt of any losses incurred. They had to carry on their business upon fair commercial lines. He considered the position, with the Corporation running the electricity works, was most unfair to the Company. The report was adopted, and a dividend was declared of 5 per cent. on the original stock and 4¼ per cent. on the additional capital stock, less income-tax.

Water.

An Improving Position at Bridport.

The state of affairs revealed by Mr. T. A. Colfox, the Chairman of the Bridport Water Company, at the recent half-yearly meeting was satisfactory to the shareholders—showing, as it did, a continuance of the improvement which followed on the report and advice some time ago secured by the Board from Mr. W. A. M'Intosh Valon, as referred to in the "JOURNAL" for Sept. 29 last year (p. 828). The accounts showed a balance available for distribution, after paying fixed and interest charges and income-tax, of £671, which admitted of the full dividends on the 5 and 4½ per cent. preference shares and 4 per cent. (1903) ordinary shares, and one at the rate of 3½ per cent. per annum on the remaining ordinary shares; the dividends on both classes of ordinary shares being free of income-tax. The Chairman said they had a right to consider the future as being very hopeful. They had, after many years' struggle, reached a position which enabled them to pay a dividend to the ordinary shareholders, who had waited so long; and it was a dividend that was slowly improving.

Ample Resources at Woking.

Presiding at the half-yearly meeting of the Woking Water Company on Monday of last week, Mr. Charles Horsley, J.P., said that, in consequence of the amount of money they had had to expend on their new works, they would still have to wait a little longer before getting any extra dividend. They had obtained the capital, and the pipes were all laid; and now they were waiting for the district. During the past half year, the revenue had increased by £313; and if this rate of growth continued, it would soon bring the dividends up considerably. He had no doubt they would in time be able to divide more; for the district was a very fine one. They had plenty of water, too; and it was exceedingly good—which was a very great point. They would not therefore have to go to the river for an additional supply until the district was more developed. A shareholder had written to the Company on the subject of a reserve fund. They had no reserve fund; but they were keeping the works in good order. Of course, if the proprietors wished it, they could divide 3½ per cent., and put the other ½ per cent. aside as a reserve; but he did not think it would be wanted, as in a few years' time everything would be all right. Taking the report altogether, it was a good one. The dividend was rather small; but there was no doubt they would be able to maintain it at 4 per cent. Indeed, in a short time he trusted they would be able to raise it to 4½ or 5 per cent. He then formally moved the adoption of the report, which stated that the balance at the credit of the profit and loss account was £3282, out of which the Directors recommended the payment of a dividend at the rate of 4 per cent. per annum for the half year, less income-tax, which would absorb £3203, and leave about £79 to be carried forward. Sir John Baker, J.P., in seconding the motion, said he was surprised that any shareholder should want a reserve in cash. The Company's reserve was in the large expenditure of capital which would serve the district for many years; and this was quite sufficient. The proprietors ought to be perfectly satisfied with the solidity of their investment and the future of the undertaking. The security was abundant; and there was no doubt as to the prospects. As an instance of the support they received, he might point out that there had been no difficulty whatever in raising the large amount of capital needed to develop the works. Had it not been necessary to obtain this money, the Company would at the present time have been paying a 6 per cent. dividend and carrying forward a substantial amount. The report was adopted.

GAS SUPPLY IN AUSTRALIA.

We are able to publish to-day particulars regarding the results of the past half-year's working of some of the principal Australian Gas Companies.

Melbourne.

At the fifty-third half-yearly meeting of the shareholders of the Metropolitan Gas Company of Melbourne, held on July 28, Mr. John Grice, who presided, stated that, as compared with the corresponding period of the previous year, the profit for the six months carried to net revenue account was greater by about £2250; the receipts from sales of gas showing an increase of £2626, and residuals an improvement of £2737. Under the heading of repairs and maintenance of works, &c., the expenditure had been heavier; but this was a matter for which the Directors need offer no excuse, as the plant and machinery must be kept in the highest possible state of efficiency. Wages at the works were £2185 less than for the corresponding period of last year—due mainly to the new machinery erected at the West Melbourne station. The most gratifying feature of the half year was the increase in the number of new customers; and active steps were being taken, with satisfactory results, to introduce gas into houses hitherto lighted by other means. Gas cooking was a field in which it was recognized as impossible for the competition of electricity to make itself felt to any appreciable extent; and when the advantages of gas were considered, as compared with the inconvenience, annoyance, and dirt involved by the use of coal and other fuels, it was not surprising that the public were more and more realizing the benefit of gas-stoves. The use of gas for motive power showed an increase of some £600; and, notwithstanding the superficial advantages of the electric motor as compared with the gas-engine, the most economical results were undoubtedly obtained from the latter. With gas at 4s. per 1000 cubic feet, the cost of running a modern gas-engine, as compared with an electric motor, with current at 2d. per unit, was in favour of the gas-engine by about two to one. He then proceeded to show that electricity in Melbourne, for lighting purposes, candle power for candle power, cost more than five times as much as gas, and afterwards referred to some of the latest installations of incandescent gas lighting in England. Finally, he remarked that the explanation why gas occupied the first position for street lighting was because it was more economical in cost and more diffusive and efficient in effect. It lit the footpaths where the light was required, and did not illuminate the tops of the houses and the sky. The use of electric incandescent lights in Berlin, Paris, and London was so limited as to indicate (notwithstanding the appreciation for this method of lighting shown by the Melbourne Corporation) that they were altogether unsuitable for street lighting purposes. The motion for the adoption of the report was agreed to.

Sydney.

The report which was adopted at the recent annual general meeting of the Australian Gaslight Company stated that the profits for the half year to June 30, after making provision for bad and doubtful debts, deducting interest on borrowed money, repairs and renewals, depreciation of plant, working expenses, and all other charges, amounted, with the balance brought forward, to £60,643. Out of this, the Directors recommended the payment of a dividend for the six months of 9s. per share, free of income-tax, which would absorb £56,250, and leave a balance of £4393 to be carried forward. The Chairman (Mr. G. J. Cohen), in moving the adoption of the report and balance-sheet, said that the latter was, as usual, a favourable one. The revenue showed a considerable increase over the previous year; but, unfortunately, there was a corresponding rise in the expenditure, so that the net result was pretty much the same. The Company had the last few years been called upon to meet heavy additional expenses in the way of land, income, and municipal taxation, customs, wharfage, and harbour duties, as well as a fall in the price of coke. The appeal of the Glebe Council to the High Court of Australia, to set aside the decision of the Full Court of the State that the Company's mains and service-pipes were not liable to taxation in Municipalities, had been successful. This had led to an alteration in the charge for public lights. Recognizing the freedom of the Company from this tax in the past, the Directors had always supplied the public lights at the lowest rate possible. So low was the charge, that the Directors felt they could not meet the additional rates without increasing the price of the lights. Happily, this had been averted by a satisfactory agreement with the majority of the Councils concerned. He regretted, however, that their endeavours to come to a settlement with the Glebe were unsuccessful. At the Mayor's request, the Company were discontinuing the lighting of the borough on the last day of July. The Company had no desire to thwart in any way the decision of the Court, but had to obviate the loss the extra taxation caused. The city had to some extent now been installed with the electric light; but this did not mean the displacement at present of the whole of the gas-lamps. About 500 would at once be taken down, and others as extensions were made. The ratepayers must therefore be prepared to meet additional charges for the illumination of the city in future. The Company and the Council were still on very friendly terms; and a satisfactory agreement had been entered into for supplying with gas the lamps not displaced by electricity. As far as the diminution in the number of public lamps was concerned, he did not consider that the Company would be at any great loss, as at 4s. per 1000 cubic feet for gas, the lamps showed a deficiency of £1 1s. 9d. each per annum. Besides, the Board had written off from time to time, as occasion needed, the cost of erection. The returned lamp-pillars would, therefore, be a good asset—in fact, applications were already to hand for the greater portion of them. The number of prepayment meters fixed to date was nearly 19,000, and the demand was still as great as ever. Since the last issue of shares, three years ago, the Company had expended on extensions, gasholders, and other necessary additions, the sum of over £236,000; and as this outlay for permanent reproductive works had still to go on, it would be obligatory in the near future to further increase the capital. Supplying prepayment meters alone cost the Company £1000 a month or more; and they were called upon to lay new mains every week. During the last ten years, they had extended the mains from 558 to 791 miles, and services from 545 to 1071 miles.

Maryborough.

The operations of the Maryborough Gas Company over the first six months of this year resulted in a profit (with the balance carried forward from the preceding accounts) of £1050, which, after deducting £38 for the dividend-tax, left £1012 to the credit of profit and loss account. This the Directors recommended should be appropriated in the payment of a dividend for the six months at the rate of 6 per cent. per annum, which would absorb £771, and leave £241 to be carried forward. Gas manufacture, distribution, and management cost £508; maintenance and repairs, £208; coal, lime, and shale, £471; discounts, £447; and reserve and replacements, £200. On the other side, sale of gas, fittings, &c., brought in £2678; while residuals realized £155. The general reserve fund amounts to £7252, the equalization of dividend fund to £750, and the meter insurance fund to £250. The capital of the Company is £30,000, of which £4290 has not been called up.

Perth.

The report of the Perth Gas Company for the six months ending May 31 states that the net profit amounted to £8372, which with the balance from the previous accounts made a total of £14,525. Out of this a dividend was recommended at the rate of 2s. per share, free of duty, which would absorb £10,000, and leave a balance of £4525 to be carried forward. In order to pay off the existing overdraft, and to meet the ever-increasing demands for machinery for the extending business of the Company, the Directors proposed that 25,000 new shares should be issued to the present proprietors at a premium of 4s. each, or 24s. per share. This premium would realize £5000, which amount would be placed to the credit of the reserve fund. Of the net profit of £8372, the sum of £1930 was earned by the gas department, and £6442 by the sale of electricity. The revenue from the sale of gas, residuals, fittings, &c., was £7833; while that realized from electric current, fittings, &c., amounted to £16,154.

THE COMMITTEE ON METROPOLITAN GAS TESTING.

The Appendices to the Report.

In the official report (supplementary to the evidence, the end of which was summarized in last week's number of the "JOURNAL"), there are in all twenty appendices—consisting mainly of tables, diagrams, and documents handed in by the various witnesses, and many of them already sufficiently covered by the abstract that has appeared of the evidence adduced. Some, however, are of sufficient importance to be dealt with at greater length.

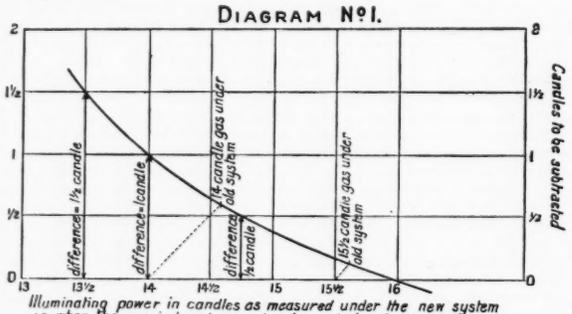
APPENDIX No. I. is a memorandum by the Board of Trade giving the *raison d'être* for the appointment of the Committee, and a *précis* of the restrictions under which the Companies work.

APPENDIX No. II.—handed in by Mr. A. Vernon Harcourt—is a comparison, in tabular form, of the methods of testing the illuminating value of gas, where the values assigned to the samples of gas vary from 12 to 15 candle power when tested with a Sugg "London" argand No. 1 and a 2-inch by 1⅜-inch chimney. The figures were as follows:—

I. At the Rate of 5 Cubic Feet per Hour.	II. So as to Give a Light of 14 Candles.	III. So as to Give a Light of 16 Candles.	I. At the Rate of 5 Cubic Feet per Hour.	II. So as to Give a Light of 14 Candles.	III. So as to Give a Light of 16 Candles.
14·8	14·6	15 0	13·4		14·3
14·8		15·0	13·1		14·4
14·6		14·9		13·3	14·1
14·3	14·1	14·7	13·0		14·1
14·3		14·7		13·5	14·1
	14·2	15·0	12·3		13·7
14·2		14·5		13·2	13·7
14·0	14·2	14·6	12·2		13·5
	14·1	14·9	11·9		13·4
14·0		14·6	11·2	12·3	12·9
13·9		14·4			

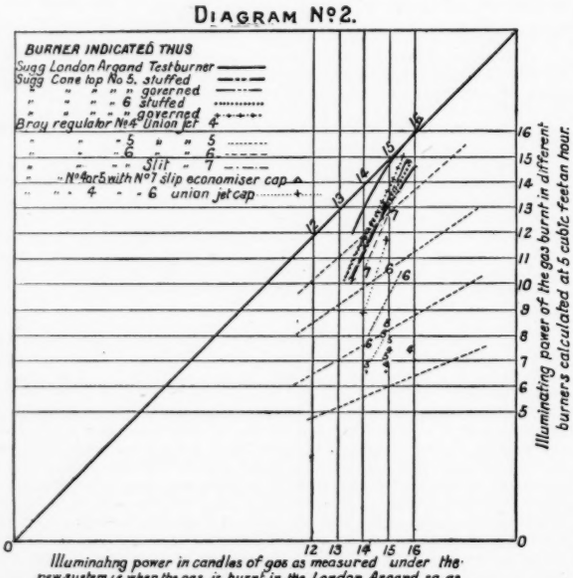
APPENDIX No. III.—also handed in by Mr. Vernon Harcourt—is a summary of some tests (carried out by Mr. W. J. A. Butterfield, at the Gas Referees' offices and at the Bedford Road testing-station in August and October, 1902, and April, 1903) of flat-flame burners consuming gas ranging in value from 16 to 13 candle power. The results, given below, are prefaced with the "note" that—"The samples of gas whose I.P. appears as 13·8 and 14·1 when giving a 16-candle flame would give a light of about 13 candles if burnt at the rate of 5 cubic feet an hour." The flat of the flame was always towards the photoped during the tests.

DIAGRAM No1.



Illuminating power in candles as measured under the new system i.e. when the gas is burnt so as to give a light of 16 candles.

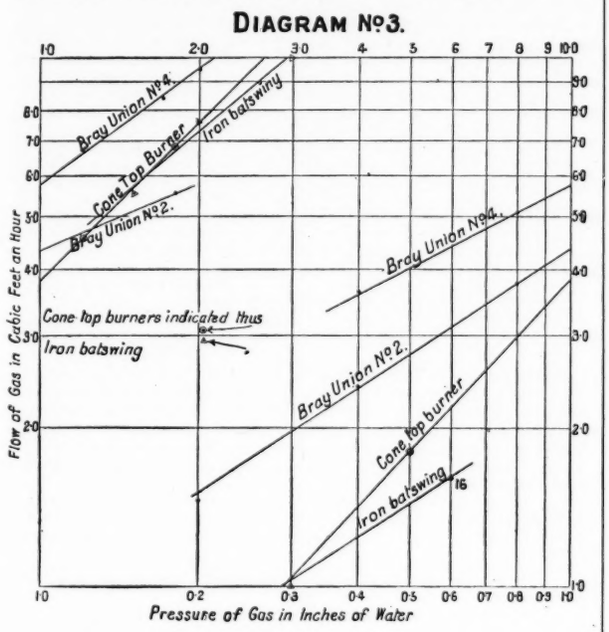
DIAGRAM No2.


BURNER INDICATED THUS
Sugg London Argand Test burner
Sugg Cone top No 5. stuffed
" " " " governed
" " " 6 stuffed
" " " governed
Bray regulator No 4 Union jet 4
" " " 5 " " 5
" " " 6 " " 6
" " " Slit " 7
" " No 4 or 5 with No 7 slip economiser cap
" " " 4 " 6 union jet cap
Illuminating power of the gas burnt in different burners calculated at 5 cubic feet an hour.

Illuminating power in candles of gas as measured under the new system i.e. when the gas is burnt in the London Argand so as to give a light of 16 candles.

Description of Burner.	Candle-Power of Flame.	Corrected Gas-Rate. Cubic Feet per Hour.	Calculated Candles per 5 Cubic Feet per Hour.	Remarks.
	c.	r.	$5\frac{c.}{r.}$	
London argand, 2-in. chimney	16·0	5·04	15·9	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, "stuffed"	11·3	4·09	13·8	Tall flame, no stiffness, almost smoky.
No. 5, "	11·4	4·05	14·1	Tall flame, no stiffness, almost smoky.
No. 6, "	14·1	4·79	14·7	Flame good shape, rather waving top.
No. 6, "	14·2	4·91	14·5	Flame good shape, rather waving top.
Bray's regulator—				
No. 5, union	7·5	5 19	7·2	Good steady flame.
No. 6, "	11·7	5·71	10·2	" " "
No. 4, "	7·4	5·10	7 3	" " "
No. 4 with No. 7 "Codac" economizer	14·8	5·01	14·8	Large flame, good shape, waving top.
London argand, 2-in. chimney	16·0	5·06	15·8	*I.P. of gas used*, at finish.
London argand, 2-in. chimney	16·0	5·33	15·0	*I.P. of gas used.*
Sugg's "cone-top"—				
No. 5, "stuffed"	11·3	4·34	13·0	Tall flame, waving top.
No. 6, "	12·5	4·52	13·9	" " "
London argand, 2-in. chimney	16·0	5·33	15·0	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, "stuffed"	12·8	4·69	13·6	Tall flame, waving top, almost smoky.
No. 6, "	14·0	5·18	13·5	Tall flame, waving top, almost smoky.
Bray's regulator—				
No. 4, union	8·1	5·52	7·4	Good steady flame.
No. 5, "	8·5	5·44	7·8	" " "
No. 6, "	12·5	5·95	10·5	" " "
No. 7, slit	18·0	7 02	12·8	Wide flame, slightly forked at corners.
London argand, 2-in. chimney	16·0	5·34	15·0	*I.P. of gas used*, at finish.
London argand, 2-in. chimney	16·0	5·19	15·4	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, governe	13·9	4·91	14·2	Well-shaped flame, waving top.
No. 5, "	14·3	5·05	14·1	Well-shaped flame, waving top.
No. 6, "	17·1	5·78	14·8	Well-shaped flame, waving top.
No. 6, "	16·5	5·64	14·7	Well-shaped flame, waving top.
London argand, 2-in. chimney	16·0	5·13	15·6	*I.P. of gas used*, at finish.
London argand, 1¾-in. chimney	16·0	5·84	13·7	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, "stuffed"	11·4	5·46	10·5	Well-shaped flame, top waving, not smoky.
No. 6, "	14·9	7·00	10·7	Well-shaped flame, top waving, almost smoky.
No. 6, governed	14·6	6·69	10·9	Well-shaped flame, top waving, almost smoky.
London argand, 1¾-in. chimney	16·0	5·76	13·9	*I.P. of gas used*, at finish.
London argand, 1¾-in. chimney	16·0	5·68	14 1	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, "stuffed"	10·8	4·68	11·5	Tall flame, waving above, almost smoky.
No. 5, "	11·6	5·41	10·7	Well-shaped flame, not smoky.
No. 5, governed	12·1	5·36	11·3	As above, not so broad, not smoky.
Bray's regulator—				
No. 5, union	8 5	7·01	6·1	Large steady flame.
No. 6, "	10·9	7·12	7·7	Good full flame.
No. 7, slit	18·7	9·07	10·3	Wide low flame, slightly forked.
Sugg's "cone-top"—				
No. 6, "stuffed"	13·9	6·04	11·5	Full well-shaped flame, near smoking.
No. 6, governed	15·1	6·58	11·5	Full well-shaped flame, not smoky.
London argand, 1¾-in. chimney	16·0	5·68	14·1	*I.P. of gas used*, at finish.
London argand, 1¾-in. chimney	16·0	5·38	14·9	*I.P. of gas used*, at start.
Sugg's "cone-top"—				
No. 5, "stuffed"	11·9	4·67	12·8	Tall flame, waving at top, slightly smoky.
No. 5, governed	15·7	6·23	12·6	Large well-shaped flame, not smoky.
Bray's regulator—				
No. 5, union	8·8	5·40	8·2	Steady, well-shaped flame.
No. 5, "	9·2	5·77	8·0	Steady, slightly horned.
No. 5, "	10·1	7 05	7·2	Steady, eared at base.
London argand, 1¾-in. chimney	16·0	5·34	15·0	*I.P. of gas used*, at finish.

Appendices Nos. IV., V., and VI. consist of diagrams handed in by Mr. C. Vernon Boys. It is explained, in reference to Diagram No. 1, that, "to find the illuminating power under the old system—*i.e.*, when the gas is burnt at the rate of 5 cubic feet an hour—subtract the number of candles shown on the vertical scale from the illuminating power as indicated, under the new system, on the horizontal scale."



Explanation of Diagram No. 3.

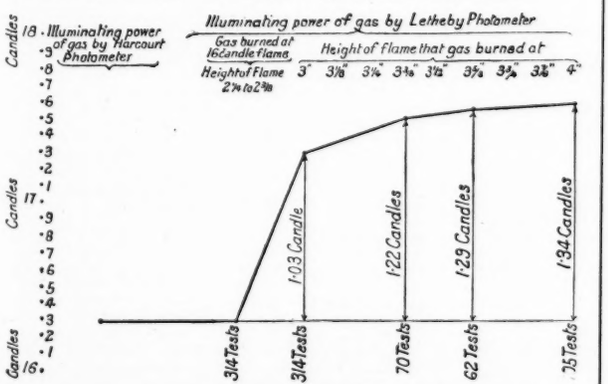
On this diagram the flow of the gas in the different burners, and the pressure causing it to flow, are plotted on vertical and horizontal scales, in which the distances from the origin instead of being proportional to the numbers (as in an ordinary equally divided scale) are proportional to the logarithms of those distances.

If then the relation between flow and pressure follows a simple index law, so that the flow in any burner is proportional to (say) the *n*th power of the pressure, the line showing the relation will be a straight line, and the value of the index *n* may be found by measuring the steepness of slope of the line. Thus if the flow should be exactly proportional to the pressure, the line will slope up towards the right at an angle of 45°—*i.e.*, the angle for which vertical and horizontal ordinates are always equal. Their ratio is 1. Therefore $n = 1$. If the flow is proportional to the square root of the pressure, the line will slope up to the right at an angle of 26½°—that is, the angle for which the vertical ordinates are half the horizontal. The ratio being ½, this also is the value of *n* indicating the square-root law. The position of the line depends on the amount of flow for any pressure, the slope *m* the rate at which the flow varies with the pressure. If, as is generally the case, the index *n* is not a whole number, or a simple fraction, such as ½, but any fraction between the two, it is equally easily determined from a measurement of the slope of the line.

The smaller the value of *n* the less will the flow vary as the pressure varies or the less sensitive will the burner be to this cause of variation. On the other hand, the steeper slope of the cone-top burner indicates that this will suffer more from variation of pressure than other burners where the velocity of efflux from a jet, and not passage through a porous plug, determines the amount of gas that passes.

Note.—Where a line runs out of the diagram at one side or at the top, it will if continued be found again at the other side or at the bottom on the same horizontal or vertical line, as the case may be.

Appendices Nos. VII. and VIII. are diagrams supplemental to the evidence by Mr. G. C. Trewby—see "Journal" for June 28.

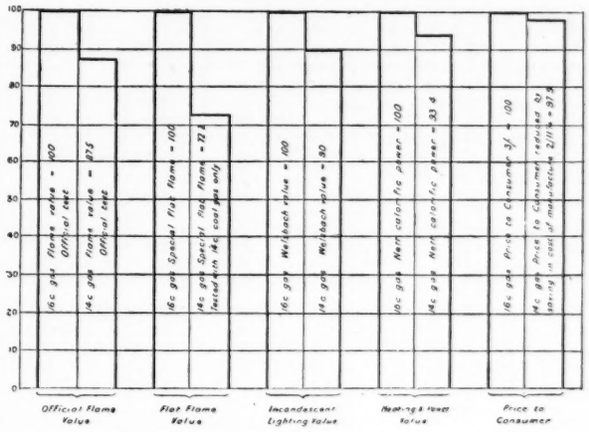


Comparison of Illuminating Power of Gas Burned in Standard Argand.

[Approximate Mixture of Gas, Two-Thirds Coal Gas to One-Third Carburetted Water Gas.]

Relative Value of 16-Candle and 14-Candle Mixtures of Coal Gas and Carburetted Water Gas.

[The Mixtures of Gas were in the Proportion of Two-Thirds Coal Gas and One-Third Carburetted Water Gas.]


16c gas Flame value = 100 Official test
14c gas Flame value = 87·5 Official test
16c gas Special Flat Flame = 100
14c gas Special flat Flame = 72·4 Illustration 14c coal gas only
16c gas Welsbach value = 100
14c gas Welsbach value = 80
16c gas Nett calorific power = 100
14c gas Nett calorific power = 93·6
16c gas Price to Consumer 3/- = 100
14c gas Price to Consumer reduced by saving in cost of manufacture 2/11 = 97·5
Official Flame Value.
Flat Flame Value.
Incandescent Lighting Value.
Heating & Power Value.
Price to Consumer

Summary Showing the Result of Change from 16-Candle to 14-Candle Gas.

The consumer pays less for his gas to the extent of	.	2·1 per cent.
On the official illuminating power, he loses in value	.	12·5 ,, ,,
In the best flat-flame burners, he loses	. . . . .	27·8 ,, ,,
In Welsbach burners, he loses	. . . . .	10·0 ,, ,,
For heating and power, he loses	. . . . .	6·6 ,, ,,

Appendix No. IX. was also handed in by Mr. Trewby. It gives the results of analyses made of the gas of the Gaslight and Coke Company in March this year.

Constituents.	Coal Gas.	Mixture of Coal (two-thirds) and Carburetted Water Gas (one-third).		Carburetted Water Gas.
	Candle Power, 15·5.	Candle Power, 14·4.	Candle Power, 16·34.	Candle Power, 20 7.
	Volume.	Volume.	Volume.	Volume.
Carbon dioxide . .	0·12	0 09	0·18	0·17
Oxygen	0·00	0·26	0·15	0·32
Hydrocarbons (absorbed by fuming sulphuric acid . .	3·83	4·64	6·52	11·32
Hydrogen	48 49	43·38	42·97	29·35
Carbon monoxide .	6·61	17 03	13·91	33·19
Marsh gas	35·90	29·29	31·00	20·48
Nitrogen	5 05	5·31	5·27	5·17
	100·00	100·00	100·00	100·00

Appendix No. X. was handed in by Sir George Livesey on March 14. It gives the results of official testings for sulphur compounds, made at Hill Street, Peckham, from July 6, 1870, to June 30, 1873—before any restrictions were imposed. The figures show the total amount of sulphur compounds in gas made from Newcastle coal with simple oxide of iron purification, no lime being used. The results summarized show the following figures:—

	Maximum Day. Grains.	Minimum Day. Grains.	Average. Grains.
Last two quarters of 1870	42·2 ..	27·6 ..	33·3
Whole of 1871	39·4 ..	20·5 ..	31·9
Whole of 1872	44·3 ..	24·9 ..	33·6
First two quarters of 1873	41·4 ..	23 8 ..	34·6

Appendix No. XI.—also handed in by Sir George Livesey—shows that the illuminating efficiency of the South Metropoliton (14½ candle) gas consumed in an ungoverned burner was as under.

Pressure.	Consumption.	Illuminating Power.	Candles per Cubic Foot.	Illuminating Power Calculated to 5 Cubic Feet per Hour.
	Cubic Feet.	Candles.	Candles.	Candles.
11¼ tenths	5·0	12 8	2·56	12·8
13 ,,	5·5	14·33	2·6	13·0
14 ,,	6·0	15·49	2·58	12·9
15 ,,	6·5	16·86	2·59	12·97
16½ ,,	7·0	18·12	2·588	12·94
18 ,,	7·5	19·44	2·59	12·96
			Average . .	12·92

Appendices Nos. XII. and XIII. were handed in respectively by Dr. Samuel Rideal and Mr. Otto Hehner. They are (1) A *précis* of experiments on the significance of sulphur in coal gas; and (2) A report on some experiments undertaken on behalf of the South Metropolitan Gas Company, on the effect of sulphur compounds in coal gas.

An indication of their contents has already appeared in the "JOURNAL," and further particulars of the lengthy documents may be reserved for the present.

APPENDIX No. XIV. was handed in by Dr. Clowes on March 21. It deals with "the results of testings made with burners supplied (by the South Metropolitan Gas Company) with gas of different illuminating power and under different pressures at the inlet of the burners; (2) the number of appeals against the reports of the gas examiners for the ten years ending Dec. 31, 1903, in respect of the twelve testing-places in the Gaslight and Coke Company's district, the six testing places of the South Metropolitan Gas Company, and the two testing places of the Commercial Company; and (3) a table showing the position of gas undertakings in England and Wales as regards sulphur restrictions.

Sections (1) and (3) are specially interesting. The former gives the following results:—

Illuminating Power of Gas. (1)	Burner Used.	Pressure at Inlet of Burner.	Gas Consumption. Cubic Feet per Hour.	Illuminating Power. Standard Sperm Candles.	"Duty." (2)	Percentage "Duty." (3)	
		Inches.				Per Cent.	
16·0	A	1·0	4·7	13·4	2·85	100	
		1·5	4·8	13·7	2·85	100	
		2·0	4·8	13·7	2·85	100	
		3·0	5·2	14·2	2·84	100	
	B	1·0	3·7	9·9	2·67	94	
		1·5	5·2	14·0	2·68	94	
		2·0	6·3	17·4	2·76	96	
		3·0	8·8	22·9	2·60	91	
15·4	A	1·0	4·7	12·4	2·64	93	
		1·5	4·8	12·6	2·62	92	
		2·0	4·8	12·6	2·62	92	
		3·0	5·2	13·4	2·57	90	
	B	1·0	3·8	9·7	2·55	89	
		1·5	5·4	14·0	2·59	90	
		2·0	6·5	17·2	2·64	93	
		3·0	9·1	23·5	2·58	90	
14·0	A	1·0	5·0	11·5	2·30	81	Approximate
		1·5	5·1	11·8	2·31	81	
		2·0	5·0	11·6	2·32	82	
		3·0	5·3	12·3	2·32	81	
	B	1·0	3·5	8·0	2·28	80	
		1·5	4·7	10·6	2·25	79	
		2·0	6·6	15·5	2·35	82	
		3·0	9·0	20·5	2·27	80	
13·1	A	1·0	5·0	9·7	1·94	68	
		1·5	5·1	9·9	1·94	68	
		2·0	5·1	9·9	1·94	68	
		3·0	5·3	10·2	1·92	67	
	B	1·0	3·4	6·6	1·94	69	
		1·5	4·8	9·4	1·96	69	
		2·0	6·7	13·1	1·92	68	
		3·0	9·2	17·8	1·93	68	

The "A" burner was the new governed burner supplied by the South Metropolitan Gas Company. The "B" burner was the ungoverned burner similarly supplied.

(1) In standard sperm candles when burnt in the standard "London" argand at the rate of 5 cubic feet per hour.

(2) The "duty" is the illuminating power of the gas per cubic foot of gas consumed.

(3) The "percentage duty" was reckoned by taking the "duty" obtained in burning 16-candle gas from the new governed burner as 100; the figures given being those obtained by burning gas of lower power in the same burner and in the ungoverned burner respectively.

Section (2) shows that, in the ten years referred to, there were, in all, only 38 appeals by the Gaslight and Coke Company from the gas examiners' reports. Of this number, in 20 cases the Chief Gas Examiner accepted the reports, and in 18 cases cancelled them. In the matter of illuminating power, 14 out of 27 reports were cancelled; and as to impurities, 7 were accepted and 4 cancelled. In the South Metropolitan Company's case, only 2 appeals as to illuminating power were lodged—one successfully and one the reverse. In the matter of impurities, no less than 33 reports were cancelled on appeal, against 7 accepted. The only appeal in regard to pressure resulted in the report being cancelled. As to the Commercial Gas Company, 5 reports were accepted and 7 cancelled in reference to illuminating power; while 9 appeals by the Company as to impurities were successful and 2 the reverse.

Section (3) gives the following figures as to the output of gas for the year 1901-2 of the various gas undertakings of England and Wales as regards sulphur restrictions:—

	Cubic Feet.	
London and Suburbs—		
Commercial Gas Company	2,893,418,000	
Crystal Palace Company	1,334,882,000	
Gaslight and Coke Company	22,639,033,000	
South Metropolitan Company	11,708,707,000	
Wandsworth and Putney Company	766,741,000	
		39,342,781,000
Brentford Company	2,099,874,000	
Mitcham and Wimbledon Company	282,520,000	
		2,381,394,000
		41,724,175,000
Provinces—		
Local Authorities	45,609,550,276	
Gas Companies	53,300,667,783	
		98,910,218,059
Total output for England and Wales		140,634,393,059

It will thus be seen that the output of undertakings in the hands of local authorities is practically one-third of that of England and Wales including London, and about one-half of England and Wales excluding London.

Before setting out the particulars of the undertakings referred to in the above totals, Dr. Clowes remarks: "Very few municipal authorities are subject to any prescribed limits of sulphur impurities; but in the case of the most important municipal authorities, they voluntarily make such tests, and it may be generally assumed that public opinion will compel a municipality to keep its gas pure in a way in which it cannot compel a company. The fact that large corporations test voluntarily shows this. As regards gas companies in the Provinces, all the most important of these have statutory limitations as to sulphur impurities, and many gas companies which have no statutory limitations voluntarily conduct such tests."

Summarizing the figures given, it is seen that the make of gas in 1901-2 of the local authorities and companies in England and Wales who either have statutory limitations as to sulphur impurities or else conduct voluntary tests, was as follows:—

Local authorities (chiefly voluntary tests)	33,519,603,058 cubic feet.
London companies (under limitations)	41,724,175,000 ,,
Provincial companies who have statutory limitations	18,330,815,500 ,,
Provincial companies who carry out voluntary tests	4,542,901,990 ,,
	98,117,495,548 cubic feet.

The tables are, it is remarked, by no means complete, as only 250 replies have been received to 530 queries sent out. Even these replies, however, show that, in at least 69 per cent. of the whole output of England and Wales, the amount of sulphur impurities is either by statute or voluntarily kept within limits. It is to be presumed that if replies had been received to all the inquiries sent out, this percentage would be very much higher.

The Continental towns supplied by the Imperial Continental Gas Association are, Dr. Clowes points out, under the following restrictions as to sulphuretted hydrogen and other sulphur compounds:—

(1.) Aix-la-Chapelle (1) No trace of sulphuretted hydrogen. (2) Other sulphur compounds: maximum quantity allowed, 26 grains per 100 feet.

(2.) Antwerp (1) No trace of sulphuretted hydrogen. (2) Other sulphur compounds: maximum quantity allowed, 30 grains per 100 feet.

(3.) Brussels (1) No trace of sulphuretted hydrogen. (2) Other sulphur compounds: maximum quantity allowed, 17½ grains per 100 feet.

(4.) Flushing, Frankfort-on-the-Main (1) No trace of sulphuretted hydrogen. (2) Other sulphur compounds: maximum quantity allowable, 26 grains per 100 feet.

(5.) Hanover (1) No trace of sulphuretted hydrogen. (2) Other sulphur compounds: maximum quantity allowable 22 grains per 100 feet.

The figures for sulphur compounds other than sulphuretted hydrogen are the maximum quantities allowable; and the average quantities present are very much below these figures. The average quantity allowable in the gas supplied to Brussels is about that allowed in the gas supplied to London during the summer months—22 grains per 100 cubic feet. The maximum quantity of sulphur allowed to be present in the gas supplied to Hanover is 22 grains per 100 cubic feet of gas.

Appendix No. XV. gives in diagram form (as prepared by Dr. Clowes) the annual average results of tests made by the portable photometer (during the years 1884 to 1903) of the illuminating power of the gas supplied to London, as distinct from the official tests made at the testing-stations; also the varying rates charged, per 1000 cubic feet, by the three Companies. The highest and lowest results were: Gaslight and Coke Company 16·4 in 1887 and 15·1 in 1896 and 1899. South Metropolitan Company, 16·3 in 1884, and 14·1 in 1902. Commercial Company, 16·4 in 1886 and 14·3 in 1897.

APPENDIX No. XVI. gives a summary of the results obtaining in experiments on gases of different illuminating power—carried out at the Bankside Gas-Works, under the supervision of Mr. Charles Carpenter, by whom the paper was handed in.

Illuminating Power.	Calorific Power. B.T.U.		Incandescent I. P.	Percentage Composition.		
Candles.	Gross.	Nett.	Candles.	O_2.	CO.	C_2H_4, etc.
None	424	377	56·20	0·4	9·4	0·6
8·59	498	451	59·80	0·2	8·8	0·6
10·07	541	493	60·92	0·4	8·0	1·4
10·10	555	493	59·75	0·2	10·0	1·4
11·03	533	485	63·30	0·6	7·8	2·0
11·04	515	465	62·10	0·2	10·4	1·4
11·13	510	450	61·70	0·2	9·0	0·6
11·26	567	512	61·80	0·2	10·8	1·6
11·77	563	512	62·90	0·3	9·6	1·7
12·09	572	519	62·66	0·3	7·2	1·7
12·24	563	507	60·00	0·2	9·8	2·4
12·26	553	503	64·20	0·2	7·8	1·8
13·50	554	495	60·83	1·6	7·8	3·4
13·54	639	574	61·80	0·2	8·2	2·6
13·83	651	590	61·30	0·4	7·4	3·2
14·06	582	532	64·30	0·4	7·8	3·2
14·10	597	535	62·22	0·6	7·6	3·0
14·22	650	589	63·70	0·4	9·8	3·2
14·30	617	570	64·80	0·6	8·2	4·0
14·49	621	563	62·60	0·4	7·8	3·6
14·73	651	593	64·20	0·4	8·0	4·0
15·58	640	587	66·00	0·4	9·0	4·6
15·75	674	605	64·40	0·2	9·2	5·0
16·10	631	581	65·90	0·4	8·0	5·4
16·49	712	648	65·90	0·2	8·4	5·6
16·94	712	660	69·10	0·4	8·6	5·2

APPENDIX No. XVII. (by Dr. Clowes) deals with another phase of the sulphur question raised by Dr. Rideal and Mr. Hehner, and may most conveniently be dealt with when the earlier appendices on the same subject are noticed.

APPENDIX No. XVIII. was prepared at the instance of Sir George Livesey in view of the fact that the London County Council witnesses said, in opposition to the South Metropolitan Bill of 1900, that a reduction of 2 candles illuminating power, or 12½ per cent., would necessitate the consumption by the flat-flame burners of a enormously greater proportion of gas to obtain the same amount of light as before. No such increase has been found to have taken place; the accounts of the consumers are certainly not larger, and complaints of bad lights have not increased. The following figures relate to the South Metropolitan Gas Company and the Crystal Palace District Gas Company; the policy of both Companies being the same generally and as regards the introduction of incandescent burners. But there was no reduction of illuminating power by the latter Company.

SOUTH METROPOLITAN GAS COMPANY.

	Price of Gas.	Increase of Gas Sold.	Increase of Consumers.	Cooking Stoves.
	s. d. s. d. s. d.	Per Cent.		
December, 1898 ..	2 3	.. 5·00	.. 16,863	.. 14,849
June, 1899 ..	2 2	.. 4·70	.. —	.. —
December, 1899 ..	2 1	.. 8·25	.. 10,282	.. 16,927
June, 1900 ..	2 1, 2 4, 2 8	.. 12·25	.. —	.. —
December, 1900 ..	2 8	.. 1·80	.. 16,804	.. 17,546
June, 1901 ..	2 8	.. 1·80	.. —	.. —
	Average	.. 5·60	14,650	16,440
December, 1901 ..	2 3	.. 6·76	.. 16,005	.. 16,826
June, 1902 ..	2 3	.. 4·52	.. —	.. —
December, 1902 ..	2 3	.. 2·35	.. 17,128	.. 17,102
June, 1903 ..	2 3	.. 0·75	.. —	.. —
December, 1903 ..	2 3	.. 2·80	.. 17,830	.. 22,247
	Average .	3·40	16,988	18,725

CRYSTAL PALACE DISTRICT GAS COMPANY.

	Price of Gas.	Increase of Gas Sold.	Increase of Consumers.	Coooking Stoves.
	s. d.	Per Cent.		
December, 1898 ..	2 7	.. 6·25	.. 2,025	.. 1,841
June, 1899 ..	2 7	.. 6·50	.. —	.. —
December, 1899 ..	2 6	.. 9·00	.. 2,124	.. 2,003
June, 1900 ..	2 6	.. 11·00	.. —	.. —
December, 1900 ..	2 10	.. 0·00	.. 2,216	.. 2,241
June, 1901 ..	2 10	Decrease 0·40	.. —	.. —
	Average	.. 5·40	2,122	2,028
December, 1901 ..	2 7	.. 6·43	.. 2,033	.. 2,150
June, 1902 ..	2 7	.. 4·20	.. —	.. —
December, 1902 ..	2 7	.. 0·40	.. 2,048	.. 1,908
June, 1903 ..	2 7	Decrease 2·00	.. —	.. —
December, 1903 ..	2 7	.. 4·60	.. 1,777	.. 1,673
	Average	.. 2·70	1,953	1,910

*** The Welsbach litigation was settled and cheap mantles secured, after June 1902, when both Companies started canvassing for consumers and arranged for the maintenance of incandescent burners.

APPENDIX No. XIX. (also handed in by Sir George Livesey) gives the average annual consumption by slot-meter consumers, taken quarterly—that is, the average consumption for the twelve months ended at every quarter for the last seven years. There was a steady increase until the Company began to change the flat-flame burners (under their Act of 1900) in 1901, when it received a check; and then as the change gradually progressed, the average consumption fell quarter by quarter.

1897.	Cubic Feet.	1901.	Cubic Feet.
Lady Day	16,263	Lady Day	18,209
Midsummer	16,167	Midsummer	18,552
Michaelmas	16,229	Michaelmas	18,606
Christmas	16,279	[Commenced to change burners.]	
1898.		Christmas	18,666
Lady Day	16,400	1902.	
Midsummer	16,495	Lady Day	18,727
Michaelmas	16,437	Midsummer	18,589
Christmas	16,766	Michaelmas	18,503
1899.		Christmas	18,334
Lady Day	17,151	1903.	
Midsummer	16,973	Lady Day	18,315
Michaelmas	17,065	Midsummer	18,127
Christmas	17,145	Michaelmas	17,975
1900.		[Change of burners completed between these two quarters.]	
Lady Day	17,896	Christmas	18,266
Midsummer	17,681	1904.	
Michaelmas	17,844	Lady Day	18,232
Christmas	18,203		

APPENDIX No. XX. was prepared by Mr. H. E. Haward, the Comptroller of the London County Council, in accordance with a request by the Committee that he would consider the question as to whether, by reducing the standard prices of the Metropolitan Gas Companies and increasing the amount by which the rate of dividend payable under the sliding-scale varies in accordance with the price of gas, it would be possible to give the Companies a greater incentive to economy than is afforded by the present sliding-scale. His report on this question is as follows.

As I have already stated in evidence, I called the attention of the Select Committee of the House of Commons in 1899 to the fact that the inducement to economy and good management offered by the sliding-scale to the Companies had steadily diminished owing to the greater proportionate increase in the amount of gas sold as compared with the growth of the share capital of the Companies. The figures which I laid before the Select Committee were as follows:—

	Gaslight and Coke Company.	South Metropolitan Company.	Commercia Company.
Consumers' share—*i.e.*, amount required to reduce price by 1d.			
1876—Amount, pounds	44,088	11,524	4,623
Proportion, per cent.	82·3	76·2	75·1
1898—Amount, pounds	87,406	38,637	9,756
Proportion, per cent.	85·5	87·4	83·9
Companies' share—*i.e.*, amount required to pay 5s. per cent.			
1876—Amount, pounds	9,511	3,615	1,529
Proportion, per cent.	17·7	23·8	24·9
1898—Amount, pounds	14,806	5,600	1,877
Proportion, per cent.	14·5	12·6	16·1

Since 1899, in consequence of the recommendations of the Select Committee, changes have been made; and the proportions of any savings which go to the Companies have been somewhat increased. On the basis of the accounts for 1903, the figures would be as follows:—

	Gaslight and Coke Company.	South Metropolitan Company.	Commercial Company.
Consumers' share—*i.e.*, amount required to reduce price by 1d.			
1903—Amount, pounds	85,536	48,260	11,741
Proportion, per cent.	80·80	85·48	82·17
Companies' share—*i.e.*, amount required to pay 2s. 8d. per cent. dividend.			
1903—Amount, pounds	20,324*	8,200	2,548
Proportion, per cent.	19·20	14·52	17·83

[* About one-fourth, or £5081, has to be applied to redemption of obsolete capital until £1,000,000 has been redeemed. This will reduce the Company's share from 19·20 per cent. to 14·40 per cent.]

It will be convenient here to set out in a table the rates per cent. of dividend payable by the respective Companies under the sliding scale, at various prices charged to the consumer for gas supplied. The table is as follows:—

Selling Price of Gas.	Gaslight and Coke (Standard Price 3s. 4d. —16 Candle Gas).	South Metropolitan (Standard Price 3s. 1d. —14 Candle Gas).	Commercial (Standard Price 3s 3d. —14 Candle Gas).
	Per Cent	Per Cent.	Per Cent.
3s. 4d.	£4 0 0	£3 12 0	£3 17 4
3 3	4 2 8	3 14 8	4 0 0
3 2	4 5 4	3 17 4	4 2 8
3 1	4 8 0	4 0 0	4 5 4
3 0	*4 10 8	4 2 8	4 8 0
2 11	4 13 4	4 5 4	4 10 8
2 10	4 16 0	4 8 0	4 13 4
2 9	4 18 8	4 10 8	4 16 0
2 8	5 1 4	4 13 4	4 18 8
2 7	5 4 0	4 16 0	5 1 4
2 6	5 6 8	4 18 8	*5 4 0
2 5	5 9 4	5 1 4	5 6 8
2 4	5 12 0	5 4 0	5 9 4
2 3	5 14 8	5 6 8	5 12 0
2 2	5 17 4	5 9 4	5 14 8
2 1	6 0 0	*5 12 0	5 17 4
2 0	6 2 8	5 14 8	6 0 0

* Present price of gas and authorized rate of dividend.

In considering what alterations of the standard prices and sliding-scale rates of dividend could be made, the first difficulty which presents itself is that the Companies have not the same standard prices, and are not charging the same price to the consumer. The result is that they are paying different rates of dividends; and any alteration of the standard price and sliding scale, which would be fair to (say) the South Metropolitan Company would have a serious effect on the dividend of the Gaslight and Coke Company.

The Gaslight and Coke Company in their Act of 1903 suffered a reduction in their authorized rate of dividend, with the present price of gas (viz., 3s.) of from £4 18s. to £4 10s. 8d. per cent., or if the redemption fund is deducted, to £4 8s. per cent., making a reduction of 10s. per cent.

It must, I think, be taken as a *sine quâ non* that, unless the Companies are before Parliament with Bills asking for further concessions, any change in standard price must be such as not to reduce (other circumstances remaining the same) the dividends now paid by the Companies —*i.e.*, the Gaslight and Coke Company would resist any proposed change which would reduce the dividend payable, with the price of gas at 3s., below £4 10s. 8d., even although the change might have the effect of more rapidly increasing, than is now the case, the dividend which would be payable, if the price of gas were reduced below 3s.

For example, supposing the standard price of the Gaslight and Coke Company were reduced from 3s. 4d. to 3s., and the dividend was made to increase or decrease by 5 per cent., instead of 2s. 8d. per cent. for each 1d. of increase or decrease in the price of gas, the effect would be to reduce the Company's dividend, with the present selling price of gas at 3s., from £4 10s. 8d. to 4 per cent., and the Company would not derive any benefit from the new sliding scale until the price of gas were reduced to 2s. 7d., when the dividend payable by the Company would be £5 5s., per cent., in lieu of £5 4s. In other words, the Company would be asked to give up ½ per cent. of dividend in return for a greater incentive to economies, leading to the reduction in the selling price of gas.

The reduction of the standard price to 2s. 9d., even with a sliding-scale dividend of 10s. per cent. for each 1d. of increase or decrease in the price of gas, would probably be open to still greater objection on the part of the Company, as the effect would be at the present selling price of gas to reduce the dividend of £4 10s. 8d. to £2 10s. per cent.

The following table illustrates the effect in the case of the Gaslight and Coke Company of reducing the standard price and varying the rate of sliding-scale dividend in the two ways indicated above :—

Selling Price of Gas.	Present Authorized Rate of Dividend, Standard Price 3s. 4d.; Dividend increasing or decreasing by 2s. 8d per Cent..	Authorized rate of Dividend if Standard Price were reduced to 3s.; the Dividend increasing or decreasing by 5s. per Cent.	Authorized rate of Dividend if Standard Price were reduced to 2s. 9d.; the Dividend increasing or decreasing by 10s. per Cent.
3s. 4d.	£4 0 0	£3 0 0	£0 10 0
3 3	4 2 8	3 5 0	1 0 0
3 2	4 5 4	3 10 0	1 10 0
3 1	4 8 0	3 15 0	2 0 0
3 0*	*4 10 8	4 0 0	2 10 0
2 11	4 13 4	4 5 0	3 0 0
2 10	4 16 0	4 10 0	3 10 0
2 9	4 18 8	4 15 0	4 0 0
2 8	5 1 4	5 0 0	4 10 0
2 7	5 4 0	5 5 0	5 0 0
2 6	5 6 8	5 10 0	5 10 0
2 5	5 9 4	5 15 0	6 0 0
2 4	5 12 0	6 0 0	6 10 0
2 3	5 14 8	6 5 0	7 0 0
2 2	5 17 4	6 10 0	7 10 0
2 1	6 0 0	6 15 0	8 0 0
2 0	6 2 8	7 0 0	8 10 0

* Present selling price of gas and authorized rate of dividend

The table shows how difficult it is to suggest any alteration of the existing sliding-scale arrangements in the case of the Gaslight and Coke Company. The object of the public is to secure gas at a low price; and every reasonable inducement should be held out to attain this object. On the other hand, a company cannot be expected to accept a large reduction in its present authorized rate of dividend under existing circumstances, unless there is a prospect of so reducing the selling price of gas as to restore the dividend to its present level, *plus* something more as an inducement to accept an immediate sacrifice and the risk attendant on any change. I do not think, therefore, that it is possible at the present moment to suggest any alteration in the standard price of the Gaslight and Coke Company.

The case of the South Metropolitan Company stands on a different footing. The price at present charged by the Company to its consumers for gas—viz., 2s. 1d.—is so low that it is comparatively easy to determine the standard price which would give the Company a sufficient margin for increase of price before suffering a reduction of dividend below the standard rate of 4 per cent., and at the same time allow of a new sliding-scale of dividend which would give the Company a greater share in savings effected of economies, works, &c. For example, if the standard price were reduced to 2s. 7d., and the increase or decrease of dividend fixed at 5s. per cent. for each 1d. of increase or decrease of the price of gas, the Company wonld at the present price of 2s. 1d. be able to pay a dividend of £5 10s. per cent. in lieu of £5 12s. now authorized. But the next reduction of 1d. in the price of gas—viz., to 2s. per 1000 cubic feet—would give the Company an advantage over their existing sliding scale; and this advantage would increase as the price of gas was reduced. The following table illustrates the foregoing :—

Selling Price of Gas.	Present Authorized Rate of Dividend; Standard Price 3s. 1d.; Dividend increasing or decreasing by 2s. 8d. per Cent.	Authorized Rate of Dividend if Standard Price were reduced to 2s. 7d.; Dividend increasing or decreasing by 5s. per Cent.
2s. 9d.	£4 10 8	£3 10 0
2 8	4 13 4	3 15 0
2 7	4 16 0	4 0 0
2 6	4 18 8	4 5 0
2 5	5 1 4	4 10 0
2 4	5 4 0	4 15 0
2 3	5 6 8	5 0 0
2 2	5 9 4	5 5 0
2 1	*5 12 0	5 10 0
2 0	5 14 8	5 15 0
1 11	5 17 4	6 0 0

* Present selling price of gas and authorized rate of dividend.

The above is not put forward as a definite suggestion on behalf of the London County Council, but merely as an illustration of the fact that the circumstances of the South Metropolitan Company lend themselves to the possibilitity of such a revision of the present sliding-scale arrangements as would, without injustice to the shareholders, under existing circumstances, increase the inducement to the Company to effect economies leading to a reduction in the price of gas.

In a similar way, I think it would be possible to make some satisfactory proposal to the Commercial Company.

The Committee will, of course, understand (says Mr. Haward, in conclusion) that if any alteration in the sliding-scale arrangements is to be made, the whole terms and conditions of any changes which may be proposed as regards illuminating power, testing, &c., must be considered at the same time. In the foregoing memorandum, consideration has been limited entirely to a possible revision of the standard price with a view to giving further inducements to economy, but without reference to other matters affecting the question.

Petrol gas has just been installed for the public lighting of Sabden during the winter months. It is to be consumed through incandescent burners; and last Saturday week, when a trial was made, the effect was agreed to be very satisfactory. It is thought that the cost will amount to £2 10s. per lamp, with accessories.

HARROW AND STANMORE GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held yesterday week at the Albion Tavern, Aldersgate Street, E.C.—Mr. CHARLES HORSLEY, J.P., in the chair.

The ENGINEER and SECRETARY (Mr. J. L. Chapman) having read the notice calling the meeting, the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, first referred to the report, observing that he considered it a remarkably good one. The Directors had the greatest pleasure in announcing that the business continued to progress, and that they had been able to give notice of a further reduction in the price of gas, as from Michaelmas next. The balance of the profit and loss account was £6044. This was good; in fact, the balance-sheet was one of the best the shareholders had ever had. Their progress was being rapidly made; and he did not think the works would be any too large for any length of time if the increase continued as fast as at present. He was happy to say, however, that they had the ground on which to make extensions. Examining the accounts, he said the total receipts amounted to £13,416, which was an increase of £1243 over the corresponding period of last year. The gas-rental was £10,731, which was an advance of £754, although the price charged was 2d. per 1000 cubic feet lower. The quantity of gas sold was 52,071,000 cubic feet, which was an increase of 5,871,000 cubic feet, or equal to 12·70 per cent. The income from meter fittings and stove rentals was £718; being an increase of £109. The receipts for coke and breeze amounted to £1881, or an addition of £298. The receipts for tar amounted to £342; and for sulphate to £215—both items having increased. The total expenditure was £8962, which was an advance of £1008 on the first half of last year. Coal had cost £151 more; but some 192 tons more had been carbonized. On oil, too, there had been an additional expenditure of £122, but a further 5242 gallons had been used. Purification had also cost them rather more; but rates and taxes were somewhat less. It was interesting to note that 240 cooking-stoves had been fixed in cottages where coin-meters were in use; and the cost of this—£420—had been charged to revenue. On the renewal of mains, services, meters, and stoves, £350 beyond the amount charged last year had been spent. The result of the working, however, was a profit for the six months of £4454, which was an increase of £235 over the corresponding period of last year. The dividend and mortgage interest would require £4013; and this would leave a balance of £441 to be carried to the previous balance of £2062—thus making a total balance in hand of £2503. The make of gas was 56,110,000 cubic feet. The quantity of coal used was 3552 tons, from which 39,359,000 cubic feet of gas were made, or an average of 11,080 cubic feet per ton. The oil used was 48,453 gallons; the gas made being 16,751,000 cubic feet, which meant a consumption of 2·88 gallons of oil per 1000 cubic feet. The quantity of gas sold was 52,071,000 cubic feet; used on the works, 642,000 cubic feet; and unaccounted for, 3,397,000 cubic feet, or 6·05 per cent.

The VICE-CHAIRMAN (Mr. A. H. Baynes) seconded the motion, which was unanimously carried.

A dividend was declared at the rate of £9 5s. per cent. per annum on the original "A" capital, of 7 per cent. per annum on the additional "B" capital, and of £6 9s. 6d. per cent. per annum on the additional "C" capital and guaranteed shares, all less income-tax.

On the proposition of the CHAIRMAN, seconded by Mr. ROBERT RANDALL, a vote of thanks was passed to the Engineer and Secretary, of whose services the Chairman spoke in the highest terms.

Mr. CHAPMAN, in his reply, remarked how pleased he was to have seen the Company become so prosperous. The works were in excellent condition, and they had buildings and manufacturing power, in proportion to their size, second to none in the country.

Mr. F. R. SMITH, in moving a vote of thanks to the Chairman and Directors for their conduct of the business, remarked that he trusted the Directors would not be in too great a hurry to pay an increased dividend, even though they were reducing the price of gas. The capital was still large; and they had no reserve fund. He therefore thought the Directors were very wise in strengthening their position by reducing the price of gas.

Mr. A. W. OKE, in seconding, said he took rather a different view from Mr. Smith. In his opinion, these sliding-scale companies should be worked for the mutual benefit of the consumers and shareholders; and he had no doubt the Directors would take every care to see, while the consumers were getting full benefit, that the shareholders, when it was prudent, had the advantage of the increase in dividend to which they were entitled.

The motion was unanimously carried.

The CHAIRMAN briefly acknowledged the vote; and this concluded the proceedings.

INCANDESCENT GAS LIGHTING AT WHITWORTH.

Some conversation took place at last week's meeting of the Whitworth Urban District Council with reference to the incandescent lighting of the streets. It was proposed by one member at a meeting of the Lighting Committee, that this system of illumination should be dispensed with during the coming winter, and by another that it should be continued. The voting being equal, the Chairman gave his casting vote in favour of the first-named proposition. On the matter coming before the Council, Mr. Haworth moved that it should be referred back; and Mr. Robinson seconded, remarking that to revert to the old system would be going back forty years. The Chairman (Mr. W. Law) pointed out that the Surveyor had estimated the cost of putting the incandescent lamps in order for the coming season would be £40 or £50; and Mr. Rudman said that the Committee's decision was arrived at on account of the cost. The Surveyor (Mr. J. C. Clegg) remarked that they were obliged to have a bye-pass on the lights, or

they would need a man to go round. So long as the bye-pass was on, it was impossible to save gas, because it was being consumed all day, and they were paying through the meter for it. The system would cost at least £50, in addition to the sum for ordinary lighting. Some 42 out of the 56 lamps were not adapted for incandescent lighting. The lamps were very much exposed, more so than in places like Rochdale. The Chairman said he voted against the continuance of incandescent lighting solely on the ground of cost. He had no objection to the light at all. They could not, however, afford to experiment in lighting at the present time; and he thought for one season, seeing that the old material was practically useless, they might dispense with it. After some further discussion, during which it was stated that it cost 10s. a week last season for renewing mantles, the amendment referring back the incandescent lighting minute was carried by five votes to four.

GAS v. ELECTRICITY AT EXMOUTH.

Advocates of the electric light in the Exmouth district received a decided rebuff last week, when there was published a report by the Surveyor to the Urban District Council recommending that incandescent gas be adopted as the means of lighting the Esplanade. The Surveyor had gone into the question of the comparative cost of incandescent gas and electricity, and found—as anyone with an open mind must find—that gas is the more economical. He apparently proposes to do the thing thoroughly, and to make the Esplanade as bright and cheerful as such a place should be. The number of lamps is to be increased to 33 in all. One of them, at the junction of two roads, it is proposed to fit with burners for 1000-candle power; while of the remainder, 20 are to be of 300-candle power and 12 of 150-candle power. The cost of providing the new pillars and new lanterns and burners throughout is estimated at £196, and the extra annual expense of maintenance at £65. The Roads Committee, to whom the report was submitted, approved of the Surveyor's plan, and recommended the Council to carry it out. This appears to have been a great shock to the advocates of the electric light; for at the Council meeting on Wednesday, there was quite a pathetic appeal from the Electric Supply Corporation for the postponement of the Council's decision in the matter. The Company appreciate the advantage of lighting the Esplanade as a means of advertising their business, and they also know that the people of Exmouth will be quick to understand that the light which is the best and cheapest for the Esplanade is the best and cheapest for the rest of the town. Their letter stated that the Directors of the Electric Supply Corporation were most anxious to obtain the contract for the lighting of the Esplanade, and wished to make the lowest possible tender for the purpose of securing it. Before tendering, their representative would like to discuss the matter with some members of the Council, and would visit Exmouth for the purpose. The letter appears to have put the District Council in a quandary. They are virtually the parents of the electric light scheme; for the Electric Lighting Order, though it has now been assigned to the Electric Supply Corporation, was obtained by the Council; and the new means of illumination has found many advocates in the Council Chamber. It is, of course, a disappointment to the Electric Supply Corporation to find that they are likely to receive less active support from the Council than they were possibly led to expect. But the Council, while perhaps under some implied obligation to the Company, cannot very well ignore the report of their own official, and will sadly stultify themselves if, in face of his recommendation, they adopt the more costly and less efficient means of lighting. However, the representative of the Electric Supply Corporation is to have the chance of seeing members of the Council. The result of the interview and the final decision of the Council, whatever it may be, cannot fail to be of interest.

THE SUPPLY OF GAS AND WATER IN MOSCOW.

In the course of an article on "Municipal Moscow," published in "Public Works," M. Schokstoff gives some particulars as to the lighting and the water supply of the city. With regard to the former, he says that, although in Western Europe the artificial lighting of towns existed in the sixteenth century, the same practice was not started in Moscow until nearly the middle of the eighteenth century. At the present time, there are in Moscow three forms of public illumination—gas, kerosene, and electricity. The whole lighting costs about £38,000 per annum. The largest item is £20,000 for kerosene oil lighting, as it is the most extensively used; gas comes next with £13,000; and electricity last with £5000. Public lighting in Moscow is very unsatisfactory, and cannot be compared with any of the large cities of Europe. Gas lighting is at present performed by contract with a private Company, who receive about £1 for each burner used for 2000 hours per annum. The contract with the Gas Company will expire in 1905; the works and the entire lighting installation then become municipal property. The number of gas-lamps is about 8000; and incandescent burners have been put up in many streets. Oil lighting is carried on by the city authorities; and fully 10,000 kerosene lamps are used for this purpose. Electric lighting comes under two different headings—(*a*) the lighting of streets and squares, and (*b*) the lighting of the square round the Saviour's Temple, the large stone bridge, and, in summer only, the concert pavilion in the Sokolinki Park. The city have handed over to the Electric Company the lighting of the streets and squares until 1920; but hitherto only 125 lights have been put up in one street and two squares, which cost the city £3432 per annum. The rest of the electric lighting is managed by the municipal authorities, and costs in all £1295 per annum. Speaking generally, it may be said that electricity is practically of no account in Moscow, which in respect of lighting is terribly behind large towns in other European countries.

The city is supplied with water from springs 10 miles away, which yield about 10 million gallons a day. The works in connection with this scheme were constructed by the City Council at a cost of about £1,050,000. The interest on capital borrowed for this purpose, as well as the cost of maintenance and management, is more than covered by a charge of 10d. per 1000 gallons. Charges are invariably based on the quantities used; and the necessary water-meters are furnished by the Water Department. As the present supply of 10 million gallons a day is insufficient for the needs of the city, the Council decided, in 1900, to construct new water-works, which will furnish a further quantity of 10 million gallons daily. The entire project provides for an additional supply of 40 million gallons per diem, at a total cost of about £5,500,000. At present, however, only one section of the scheme is in course of execution. The source of the new supply will be the River Moskva, on which an intake is being established at a distance of about 10 miles above the city. Water from the river will first enter covered reservoirs containing half-a-day's supply, where time will be allowed for sedimentation before it is passed to the sand filters. The area of the latter has been calculated to allow a filtration of 4 inches per hour. After passing through the filters, the water will be pumped up 36-inch cast-iron pipes to a height of 265 feet into a service reservoir, which will be constructed on the Sparrow Hills at high ground on the southern side of the city. From the service reservoir, the water will be conveyed by a new network of pipes which is to be laid along the principal thoroughfares in the outskirts of the city, where no regular water supply has hitherto been available. It is expected that the first part of these works will be completed during the present year. The full supply is calculated at the rate of 20 gallons per head per diem.

THE JUBILEE OF THE GAS SUPPLY OF ROME.

As has already been stated in the "JOURNAL," Rome has now possessed a public gas supply for a period of fifty years; the Anglo-Romano Gas Company having commenced operations in 1854. The first year, the Company sold 3,531,700 cubic feet to private consumers, and 4,238,040 feet to the city. The service developed slowly, but surely; and in 1870, the first year of the Italian occupation, the consumption was 99,947,110 cubic feet, while two years later it was 192,124,480 feet. By 1892, the output had increased to 330,461,340 feet; but from this date there was some fluctuation for several years, due no doubt to the commercial crisis which overtook the city, the growing use of electricity, and the introduction of incandescent gas lighting. In 1898, however, there was a resumption of progress. The advantages of the incandescent system began to be properly realized; and many people who never before used gas adopted it.

The extent of the subsequent development can be understood by glancing at the reports of the Company for 1900 and 1902. In the former year there were 7836 street lamps, in the latter 8410; while the number of burners in use for private consumption increased from 127,165 to 144,042. The total sale of gas in 1900 was 571,429,060 cubic feet; and in 1902, 591,245,825 feet. At the same time a growing tendency was witnessed to use gas in small dwellings. In 1900, the Company installed 1051 meters, representing 4879 burners—an average of 4½ burners per meter; while the average among the whole of the consumers was 9 burners per meter. The question of unaccounted-for gas has been seriously taken in hand; the quantity lost in 1900 having been less than in 1872, notwithstanding the greatly augmented output. From the report of the Company, noticed in our issue for May 3 (p. 328), it will be seen that there was last year a further increase of 7½ per cent. in consumption; the number of public lamps having risen to 8542, and of private burners to 150,942—an increase in the latter case of 6900.

The Company have, of course, also the monopoly of electric lighting and power distribution. In 1900 there were 105,648 lamps of all types in Rome, which, when reduced to the standard of 16 candles, represented 104,489 lamps; in 1902, there were, without counting arc lamps for streets and shops, 149,452 lamps, representing 147,662 16-candle lamps; while last year the number was increased to 172,045 lamps, equivalent to 170,113 lamps of 16-candle power.

A Reduction in Price at Newry.—Owing to the continued success attending the management of the Newry Gas-Works, the Committee decided at their monthly meeting on the 2nd inst. to reduce the price of gas in the town from 4s. 2d. to 3s. 9d. per 1000 cubic feet, and outside the municipal boundary from 4s. 7d. to 4s. 2d. This means a saving of over £600 a year to the consumers, and makes a reduction of 10d. per 1000 cubic feet since Mr. Brooke Gibson took charge of the works in October, 1902.

Proposed Reduction of Price at Barrow.—At the last monthly meeting of the Barrow Town Council, the Gas and Water Committee brought forward a recommendation to reduce the price of gas from 2s. 6d. to 2s. 3d. per 1000 cubic feet. Alderman Townson explained that the profits on the undertaking had increased, and there was now sufficient margin to permit of the reduction, while still contributing several thousand pounds per annum towards the borough fund. After considerable discussion, it was decided to refer the matter back for further consideration as to how the proposal would affect the rates of the borough. The Committee will then again report on the matter.

Gas at Halifax.—At their meeting last week, the Halifax Town Council agreed to a recommendation of the Gas Committee that the price of gas should be reduced from 2s. 5d. to 2s. 3d. per 1000 cubic feet within the borough, and from 3s. 3d. to 3s. 1d. outside, with varying discounts. In moving the resolution, the Chairman of the Committee (Mr. G. H. Wadsworth) said that last year they made a profit of £24,000, a sum greatly in excess of the estimates. They obtained this increased profit chiefly in the carbonizing department. They had produced 1000 cubic feet of gas more than in the previous year from every ton of coal. He had been tempted to support a larger reduction in the price, which, in the opinion of some, the profits fully justified; but it was prudent to move slowly. They must take a portion of the profits for the formation of a reserve fund.

NEW WATER SUPPLY FOR LEEDS.

The Ure Valley Scheme.

In the session of 1901, the Leeds Corporation obtained parliamentary authority for providing the borough with an additional supply of water by tapping the tributaries of the Ure. When the project is carried into effect, it is estimated that Leeds will have an ample supply of water for thirty or forty years; and the combined yield from the Washburn and Ure Valleys will be about 34 million gallons daily. The entire estimated cost of the latest enterprise will be £2,200,000, including pipe-laying. The catchment of the drainage area is 21,140 acres, of which 3000 acres have been appropriated to Harrogate. The plans of the Leeds City Engineer (Mr. T. Hewson, M.Inst.C.E.) show four reservoirs—viz., Colsterdale, Leighton, Carlesmoor, and Laverton—with a capacity of 4543 million gallons, and a daily yield of 15½ million gallons. The sites of the first-named dams are in the Burn Valley; while the Carlesmoor and Laverton reservoirs will be built in the valley of the Laver—most of the ground necessary for the purpose having been already acquired.

It is proposed to start at once upon the Colsterdale reservoir, the largest of the series. It will cover an acreage of 170, and will have a holding capacity of 1852 million gallons, or 445 millions more than Eccup. The daily yield to Leeds will be 7,296,000 gallons, while the compensation water will be 3,648,000 gallons. The average height of the embankments in the Washburn Valley is from 60 to 70 feet, but here they will rise to 110 feet—involving the collecting and putting together of upwards of 300,000 cubic yards of earth. The ground mapped out for the reservoir is just on the edge of the moors, so that the Corporation will have a pure supply from a watershed of 8327 acres, thereby avoiding the expense to which they were put a few years back in buying wholesale farms in the Washburn Valley to prevent pollution. In connection with neither the Colsterdale nor the Leighton reservoir, three-quarters of a mile off, is any engineering difficulty anticipated. Tenders for the second undertaking are to be sent in towards the end of the year. The superficial area of water will be 105 acres; the height of the embankments, 110 feet; the capacity, 1136 million gallons; the drainage area, 2480 acres. The quantity of water available for Leeds from the reservoir will be 2,173,000 gallons per day; the compensation water being 1,086,000 gallons daily. The Colsterdale and Leighton reservoirs have to be completed in 1911.

The Carlesmoor and Laverton reservoirs will be built in the Laver Valley 5½ miles off. The former will have a top-water level area of 98 acres, embankments 101 feet high, and a capacity of 1037 million gallons; the water being drawn from a drainage area of 6330 acres. Leeds will have a daily supply from this source of 4,709,000 gallons; the compensation water amounting to 2,354,000 gallons per day. The Laverton reservoir will be simply for the purpose of compensation. Its size will be gathered from the following details: Area of top-water level, 90 acres; height of embankment, 51·6 feet; capacity, 518 million gallons. The waters from Colsterdale, Leighton, and Carlesmoor will be conveyed to the Swinsty reservoir by means of a conduit 23 miles long, of which 2½ miles will be in tunnel, which at its maximum will be 250 feet deep.

WATER-WORKS EXTENSIONS AT HARTLEPOOL.

At the close of the annual meeting of the Hartlepool Gas and Water Company the week before last, those present were invited to attend the ceremony of starting a new engine and pumps at the water-works; and on the following day a new reservoir at Crookfoot, 6 miles inland, was opened. Both functions were performed by the Chairman of the Company (Mr. W. H. Fisher, J.P.), who, on the latter occasion, was presented by Mr. Charles Fenwick (on behalf of Messrs. W. & J. Foster, the contractors for the reservoir) with a gold key to open the door of the valve-tower. The reservoir was designed by Mr. Charles R. Fenwick; while the whole of the extensions at the West Hartlepool works were designed and carried out by the Company's Engineer, Mr. Thomas Bower.

The object of the Crookfoot reservoir, which has a capacity of 200 million gallons, is to enable the Company to meet the increased demand for soft water for trade purposes. It will drain a gathering-ground of 1340 acres, over which there is an average yearly rainfall of 27 inches. In addition to the quantity of water derived from the natural drainage of this area, provision has been made for part of the storm overflow water from Hurworth Burn to be stored if necessary, which it is hoped will for a considerable time obviate the necessity for making the additional authorized reservoir at Dalton Piercy. The work has extended over 3½ years; and the cost per million gallons (apart from land, conduits, roads, &c.) has been about £160. The extensions at West Hartlepool have reference to the domestic supply, which is derived from a series of boreholes carried down into the limestone rock to a depth of 200 feet, whence an abundant quantity of pure water is obtained. The brick culverts running alongside the boreholes, and into which the water is discharged, have been deepened so as to provide additional storage for 250,000 gallons. Additional pumping apparatus has also been erected; provision for this having been made by building a commodious and imposing new engine-house adjoining. The new engine marks a considerable advance on any previously erected at these works. At a speed of 27 revolutions per minute, it is capable of delivering into the storage tanks adjoining 200,000 gallons per hour; but it is also strong enough to work at an increased speed in case of emergency.

The Otley District Council have appointed a Sub-Committee to consider the question of promoting a Bill for the purchase of the local gas undertaking.

WALKER'S PATENT

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A very pleasant and profitable day was spent at Melrose on Thursday by those members of the Waverley Association of Gas Managers who attended the half-yearly meeting. This Association differs from all others in that there is no election to membership. There was a fair average attendance of members, and there were several gentlemen not members, whose presence and contributions to the business were very highly appreciated. Mr. J. Gemmel, the President, confined himself in his inaugural address entirely to his own works and workings. In doing so he ran the risk of sliding into an egotistical vein; but a perusal of the address will show that there is not a trace of any such taint in it. Starting thus auspiciously, the meeting went on and finished without a jarring note. Along with a very free interchange of ideas there was much good-will; and a very happy meeting was brought to a fitting close by a most delightful excursion to Abbotsford. It is a pleasure to be able to testify to the fact that the Waverley Association is keeping its head above the water as bravely as any of its juniors.

The Committee for the Eastern District of the Junior Gas Association for Scotland have had a meeting for the arrangement of work for the coming winter. It was reported that there are now 79 members on the roll in the district, which is considered very satisfactory indeed.

The annual meeting of one of the oldest gas companies in Scotland, and ministered to by perhaps the doyen of gas managers—Mr. Jesse Hall—was held in St. Andrews yesterday. It was the seventieth meeting of the Company. The report of the Directors stated that the quantity of gas manufactured was 48 million cubic feet, which was considerably over that of the previous year. The amount of coal carbonized was 4800 tons. The number of consumers was 2000—an increase of fifty over the previous year—and there was a proportionate increase of consumers with slot meters. The balance at the credit of the profit and loss account was £1587. A dividend at the rate of 50s. per share was declared. In moving the adoption of the report, which was agreed to, the Chairman referred to the satisfactory position of the Company, and to the excellent management of Messrs. Jesse and Robert Hall, the joint Managers.

In the Aberdeen Town Council on Monday, Mr. Kemp, the Convener of the Gas and Electric Lighting Committee, moved approval of the accounts of the two departments, a summary of which I gave last week. Upon the gas accounts he said that the revenue from the sale of gas to ordinary consumers had increased by £3924, while the revenue from gas consumed through prepayment meters had risen £454. The revenue from coke had risen £1350; while that from tar and liquor had fallen by £1665. From house services the income had risen £773; while that from the hire of stoves had fallen some £37. The total income (£118,523) was, in round numbers, £4419 more than in the previous year. On the expenditure side, coal cost them £3193 less, and purifying materials £488 more. Salaries were down £321—mainly due to the retirement of Mr. Smith. Wages of stokers and labourers had risen £117. The total expenditure under the head of manufacture was £77,180, or, roundly, £2591 less. Distribution cost £135 more, and the cost of house services had risen £632. Rents and taxes were up £1962; and bad debts were £84 down. The total expenditure had been £94,753, or £29 more than in the previous year; and the balance carried to net revenue account was £23,770, or £4390 more. The net revenue account showed what had been done with this surplus. Annuities had cost £58 less, interest £50, and sinking fund £202 more than in the previous year. The outlay upon these and a contribution to reserve and fire insurance funds amounted, in all, to £18,142. There was thus a free balance of £5628, which was £4197 more than a year ago. To this had to be added the sum of £997 brought from the preceding year, making a total of £6625 to be carried to the current year's account. The capital account showed an expenditure of £328,797. There had been an increase in the manufacture of gas to the extent of 7,484,000 cubic feet. Gas unaccounted for had fallen from 6·63 to 5·22 per cent., which was the lowest figure ever reached since the undertaking belonged to the Corporation. He congratulated their new Manager on the very satisfactory results of his first year's work. They proposed to reduce the price of gas to ordinary consumers from 3s. to 2s. 10d. per 1000 cubic feet. Consumers who used prepayment meters were to get 23 cubic feet for 1d., instead of 20 feet as at present. This was equivalent to a reduction of 6½d. per 1000 cubic feet. Mr. W. Coutts, on behalf of the users of prepayment meters, thanked the Committee for the consideration they had shown to them. Lord Provost Walker, in seconding the approval of the accounts, said he was sure the Council would admit that the department was in a most satisfactory condition. They were glad to find that although they had not now their former able Manager, Mr. Smith, the new Manager, Mr. Milne, had worked the department in a very satisfactory manner. The accounts were adopted.

An untoward adverse balance of £49 16s. 2d. is the outcome of the working for the year ending May 31 last of the Nairn Gas Company, Limited, the annual meeting of which was held on Wednesday last. The Directors had every reason to believe that the current year would be a prosperous one; and they recommended a dividend at the rate of 4 per cent., to be paid out of accumulated profits. This would require £183; and there would be a balance of £346 to be carried forward. It is reported that Mr. Heillor has placed his resignation in the hands of the Directors.

An extraordinary meeting of the shareholders of the Brechin Gas-light Company was held on Wednesday, for the purpose of considering resolutions for the conversion of the Company into a limited liability company. Out of 1200 votes, over 800 were recorded in favour of the resolutions, which were unanimously adopted. The capital of the Company is to be £25,000, made up of £20,000 ordinary and 5000 5 per cent. preference shares of £10 each in both classes.

There has been a little disturbance this week with the stokers in the Dundee Corporation Gas-Works. On Tuesday morning the men went

CARBURETTED WATER-GAS APPARATUS

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CARBURETTED WATER-GAS ENGINEERS.

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	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract)	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract)	1,000,000
		KINGSTON-ON-THAMES	1,750,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
		ACCRINGTON	500,000	HAMILTON, ONT.	400,000

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.

AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

in a body to Mr. A. Yuill, the Manager, with a request that he should engage at least nine additional men. The men work in three shifts of eight hours each, and their complaint was that, the work increasing as the season advances, they have not now time in which to take their meals. Mr. Yuill declined to listen to the men, but asked the foreman to prepare a statement setting forth the men's grievances. This was done; and next morning the difficulty was removed by Mr. Yuill intimating that the extra work at present is only temporary, and that it will cease when arrangements for the winter's work are completed. The men accepted this explanation, and the incident ended.

Lord Provost Barrie, of Dundee, had a further interview on Tuesday evening with the deputation from the Trades' Council, who had requested him to call a meeting of the citizens to consider, among other matters, the refusal of the Gas Committee to pay the minimum wages to employees. The Lord Provost said he had consulted with the Town Clerk, and could not find any precedent for a Lord Provost calling a public meeting of the citizens in order to condemn himself and the Town Council, for this was practically what the request of the Trades Council amounted to. He therefore refused to call a meeting. He thought it would be much better if the Trades Council would call a meeting themselves. If they did not care to do this, they would have plenty of opportunity, when the elections came on, of discussing the questions raised with candidates and members of the Town Council.

In the Town Council of Newport, Fife, on Monday, the Convener of the Finance Committee explained the financial position of the burgh. Dealing with the Gas Department, he said that they estimated a consumption in the current year of 15 million cubic feet, which was about half-a-million increase, and the year, so far as it had gone, had amply justified this estimate. They proposed to reduce the price of gas by 5d. per 1000 cubic feet, making it 4s. 3d., less 5 per cent. discount, equal to 4s. net. The revenue from the sale of gas and residual products and from meter rents was estimated at £3416, and the expenditure—which included £1079 for coal, £1280 for interest and sinking fund, £300 for wages, fully £200 for salaries, allowing for a rise of £20 on the Manager's salary, and £220 for taxes and feu duties—had been estimated at £3378; leaving a surplus of £38 on the year's working. There was, it was reported, a steady increase of consumers, and the management continued to give the greatest satisfaction. The estimates were adopted, and the price of gas fixed as proposed.

The "Arbroath Guide" of to-day contains the following statement: "Consumers will be gratified to learn that the Gas-Works Committee of the Town Council, at their meeting on Tuesday, in approving of the estimates for the current year, agreed to recommend that the price of gas be reduced by 5d. per 1000 cubic feet to consumers by ordinary meter, and by 2½d. on gas consumed by slot meters. This reduction is all the more satisfactory coming as it does on the back of a reduction of 10d. last year; the result being that while two years ago the price of gas was 4s. 4½d. per 1000 cubic feet, it will for the present year be 3s. 1½d. While this result indicates that the works are in a high state of efficiency, and are being economically and skilfully managed, it does not show the full measure of success which has attended the management. Reference to the accounts for 1902 reveals the fact that there was an actual surplus on that year's working of nearly £4200. Unfortunately for the consumer, a considerable portion of this surplus—£1820—had to be devoted to the liquidation of accumulated deficits from the two preceding years, £1100 was paid out of revenue for the new retort-bench, and the contingency fund was increased to £1500. The 10d. reduction was expected to cause a loss to revenue of about £2900; but the actual loss has only been about £1700. This has been due to the largely increased consumption owing to the cheaper price, and also to the increased use of gas for cooking purposes; so that while the annual increase of consumption for a number of years had been 5 per cent., last year it was 9 per cent. It may also be mentioned, as still further showing the success of last year's operations at the gas-works, that a larger number of payments out of revenue have been made than had previously been customary. Thus, while for suspense account, &c., it was the practice to set aside £720, last year's revenue had to meet an expenditure of no less a sum than £3460 for these and other purposes. The large increase was for a new roof to the retort-house, new mains, and the large allowance for depreciation recommended by Mr. Andrew Gillespie, who valued the works last year."

Oakengates in Darkness.—On Saturday night, the whole of Oakengates and district was in darkness from 9.45 to 11 o'clock, which caused great inconvenience to consumers, it being market night. The failure was caused through a naphthalene deposit on the outlet of one of the gasholders; but the trouble was speedily rectified.

Allocation of Gas Profits at Fenton.—The Fenton Urban District Council have decided that the profits of the gas-works for the year to March 31 last should be divided as follows: To the reserve fund, £200; to loan account, £991 5s. 1d. To make the repayment of loan £1000, it was resolved that £8 14s. 11d. should be taken out of revenue.

The New Inverted Incandescent Gas-Lamp Company, Limited, ask for the insertion of a notice relative to the settlement arrived at between the "Star" Inverted Burner Company, Limited, and themselves, as there is, they say, some doubt in the minds of customers as to the terms of settlement agreed. The following is the form of notice mutually agreed upon: "The litigation which has been pending by the New Inverted Incandescent Gas Lamp Company, Limited, against the Star Inverted Incandescent Burner Company, Limited, and certain buyers from that Company, has now been settled out of Court, on the terms of the Star Company agreeing not at any time to dispute the validity of the New Inverted Company's patent rights in their 1900 patent for improvements in or relating to gas-burners (this being the patent on which the action was brought) and on the further terms of the New Inverted Company granting to the Star Company a licence to sell 'Star' inverted burners upon agreed royalties."

One of Three Conveyors in a London Power House.

Two similar Conveyors on order for London County Council.

Suitable for Handling Coke.

4 Installations in Hand.

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NEW CONVEYOR CO., LTD.,

SMETHWICK.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 10.

Sulphate of Ammonia.

The week opened rather quietly; but on it becoming known that the exports for August were on a satisfactory scale, increased firmness was imparted to the market, and parcels offered for sale were taken up at fully last week's prices. A noteworthy feature is that Scotland, where prices have all along lagged a little behind, shows more disposition to come into line. The total exports to the end of August are nearly 10,000 tons in excess of the corresponding period of last year. Quotations remain £11 13s. 9d. f.o.b. Hull and £11 15s. to £11 17s. 6d. per ton f.o.b. Leith and Liverpool. In forward delivery, London makers quote £12 2s. 6d, Beckton terms, for October-December, and £12 5s. for January-April delivery; while in Scotland makers' ideas are about £12 5s. per ton f.o.b. Leith, for October-March.

Nitrate of Soda.

This article is steady on the spot at 10s. per cwt. for ordinary and 10s. 3d. for refined quality; and prices remain firm for shipment.

LONDON, *Sept.* 9.

Tar Products.

The market remains quiet; and there is certainly not very much business doing. Prices are, if anything, a trifle easier all round. Some business has been done in pitch during the past week, but at low prices. Sales have been made at 27s. 6d. per ton f.o.b. London; while in Yorkshire several parcels are reported to have been placed at 27s. to 27s. 3d. for delivery all over next year. There is still a very good inquiry for January-June, and in some instances January-December next year; but buyers' ideas of prices are certainly below those which either dealers or makers are prepared to accept. In South Wales, consumers appear fairly well supplied for early delivery; but they are buyers over the first six months of next year, for which period, however, they offer lower prices than those paid for this year's shipment. This has at present the effect of checking business. Prices remain steady in the Midland district; but so far as Lancashire is concerned, there is certainly a good deal offering, and makers show a desire to sell for early delivery. Business in benzol is decidedly dull. It is reported that 90 per cent. has been sold at under 9d. per gallon in more than one instance. English consumers appear pretty well supplied; but the demand for enriching gas may improve during the next few months. So far as the Continent is concerned, there do not seem to be any inquiries just at present for either 90 or 50-90 per cent. Anthracene remains in precisely the same position. It is reported that one or two small parcels of 30-35 per cent. good London makes have been sold at 1¾d. per unit for early delivery; but for next year makers still decline to entertain business at anything under 2d. to 2¼d. There is an absence of Continental demand for solvent naphtha; but the home trade is certainly better, and there is more business doing, both in ordinary and special qualities, for prompt delivery. Makers of carbolic acid appear to show more desire to meet the market, especially as regards October-December delivery. Business is reported in the North of England over this period at 1s. 9¼d.; while it is stated that 1s. 9d. was accepted in one instance for September-October delivery. London makers appear very well sold, and are firm in their ideas just at present. Consumers do not seem at all anxious to buy forward, and are limiting their purchases to September-October delivery. It is still very difficult to fix the exact prices of crystals which are being accepted by dealers; but there is more Continental demand. The demand for creosote continues good, and in London there is a fair business doing. Consumers, however, still decline to pay 1⅞d.; and it is generally believed that London makers will accept a little less than this figure later on when the make becomes somewhat heavier. In the Yorkshire district, there is not much business doing, and prices remain in the same position.

The average values during the week were: Tar, 17s. to 21s.; pitch, London, 27s. to 27s. 6d.; east coast, 27s.; west coast, 25s. 6d. to 26s. **Benzol, 90 per cent.**, 9d.; **50-90 per cent.**, 7d. **Toluol**, 6½d. **Crude naphtha**, 2⅜d. to 2⅝d.; **solvent naphtha**, 8d. to 8½d.; **heavy naphtha**, 10d. to 10½d. **Creosote, London**, 1⅝d. to 1 11/16d.; **North**, 1⅝d. **Heavy oils**, 2d. to 2⅛d. **Carbolic acid, 60 per cent.**, 1s. 9d. to 1s. 9½d. **Refined naphthalene**, £4 10s. to £8; **salts**, 21s. to 22s. 6d. **Anthracene**, "A" quality, 1¾d. to 2d.; "B" quality, 1d., nominal.

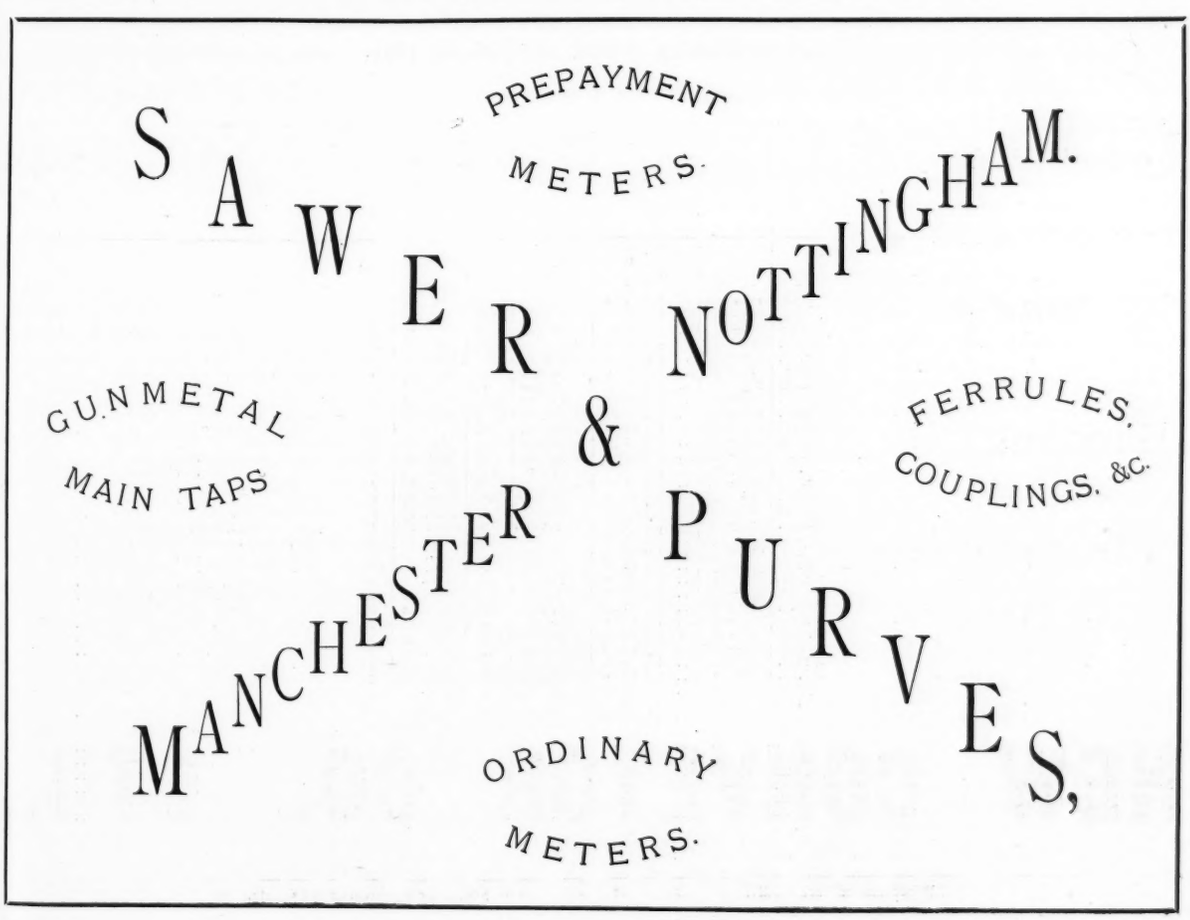
Sulphate of Ammonia.

The market closes steady, and there is still a good demand for forward delivery. Beckton have raised their price to £12 per ton; while the South Metropolitan Company now ask £12 2s. 6d. In Hull, business is firmer, and prices are well maintained. £11 13s. 9d. is reported to have been paid, and makers now ask £11 15s. In Leith, £11 16s. 3d. is said to have been refused; and makers now ask £11 17s. 6d., at which price, however, there do not seem to be any buyers, although there is an increased demand for January-March delivery. In Liverpool, there is not much doing, and prices range from £11 15s. to £11 16s. 3d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Increased deliveries in gas coal contracts have been asked for this week from some of the Lancashire collieries; but there are practically no inquiries for cannel. Short time at the collieries is still the order of things; and there is no prospect at present of either a return of any part of the 5 per cent. reduction in wages or a sufficient increase in trade to warrant any alteration in the men's terms of service. There is little doubt that when the cotton mills resume full-time working, a change for the better will be brought about at the pits. There are signs that the operative miners will not long abide by the present



agreement. Already, in consequence of the reduction of 3d. per day in the wages of the engine-men, the Hemsworth Collieries stopped on Wednesday, with the result that about 3000 men are thrown out of employment. The average coal shipments from the Cadishead and Partington tips on the Manchester Ship Canal average at present about 13,000 tons per week. The bulk of this comes from the Wigan district. Coal prices show no change, and last week's rates hold good.

Northern Coal Trade.

There is a fuller demand experienced in the coal trade, and that for several reasons. Some of the exporters are now more pressing to complete their contracts before the end of the shipping season; and there is with this improved export demand a better inquiry also for home use, with the advance of the autumnal season. Best Northumbrian steam coals are 9s. 9d. to 10s. per ton f.o.b., second-class steams are 8s. 9d., and steam smalls are 4s. In gas coals, there is now a decided improvement in the demand; and on the large contracts the deliveries show an appreciable increase. Good Durham gas coals vary in quotation from about 7s. 9d. to 8s. 3d. per ton f.o.b.; but the amount that is left for occasional sale is not large with the best types of collieries. New contracts for gas coals show no special feature. Gas coke is now more plentiful; but the market seems able to take up the production. Good gas coke is from 13s. to 13s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Trade continues to look better; but the quotations remain as before, so that matters are not so healthy as they might be. The policy of stacking coal is still being followed, which is the probable explanation of the state of the market; the demand being unnaturally inflated. The prices quoted are: Main, 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s. 3d., and splint 8s. 6d. to 9s. The shipments for the week amounted to 223,617 tons—a decrease of 38,757 tons upon the previous week, and of 24,647 tons upon the corresponding week of last year. For the year to date, the total shipments have been 7,661,828 tons—an increase of 225,612 tons upon the same period of last year.

Gas Purchase Question at Altrincham.—The Altrincham District Council last week considered a resolution by Mr. Hughes that a letter be written to the Directors of the Gas Company to ascertain whether they were prepared to recommend the shareholders to sell the undertaking to the Council; and, if so, on what terms. Several members opposed the motion, on the ground that the negotiations should be conducted privately, and that if the Directors had any desire to sell they should approach the Council. The motion was, however, carried. Ten years ago, when the Council were in negotiation for the purchase of the undertaking, the price agreed upon was £162,500; but the ratepayers in public meeting refused to sanction the acquisition of the works on those terms.

Wolstanton Council and the Chesterton Gas-Works.—The Wolstanton United Urban District Council, on the recommendation of the Lighting Committee, have agreed to take such steps as may be deemed advisable to negotiate with the Chesterton Gas Company for the purchase of their works. Mr. Corbet Woodall is to be approached on the subject of furnishing a report as to the value of the undertaking for a transfer.

The Scott-Snell Self-Intensifying Gas-Lamp Company, Limited.—The Secretary of this Company writes in reference to a paragraph, under "Legal Intelligence," in our issue last week (regarding an order for the compulsory winding-up of the Company), that they are still carrying on business under a Receiver and Manager, and that it is expected that in the course of a few months the Company will be reconstructed.

Crewkerne in Darkness.—The inhabitants of Crewkerne are much inconvenienced as the result of a dispute between the Urban District Council and the Gas Company; the Company asking an additional price for lighting the lamps this season, and the Council declining to pay more than they did last year. As neither side will give way, the streets remain in darkness. As the extra amount asked by the Gas Company is no more than £10, it should not be impossible to arrive at a settlement of the dispute.

A De Brouwer Projector for Lancaster.—The Lancaster Corporation Gas-Works are being equipped with the De Brouwer patent projector; the cost, including structural alterations to the retort-house and the auxiliary plant, being about £3500. This will be paid for out of the reserve fund, according to the custom of the Gas Committee. The price of gas is now 2s. per 1000 cubic feet net; and it is a testimony to the admirable management of Mr. C. Armitage that so many improvements have been made to the plant without adding to the capital account. Nothing is drawn for the gas supplied to the Lighting Committee for street purposes; and yet the Gas Committee are always able to hand over a substantial sum towards the relief of the rates.

Profit-Sharing at Chester.—At the annual meeting of the profit-sharing employees of the Chester United Gas Company last week, the Chairman (Mr. Gamon), who presided, said they had now come to the end of the third year's working of the scheme; and the Directors were satisfied that it had answered well. It would be gratifying to the members to know that there would probably be some increase in the bonus, by lowering the price of gas at the beginning of next year. In the working of the scheme, the men would obtain a larger bonus by the reduction of the price of gas, though the shareholders of the Company would get no advantage whatever. The report stated that the total bonus amounted to £175, and that, with balances brought forward and interest, the amount now standing to the credit of the profit-sharing employees was £374. The withdrawals had been £56; and the men had purchased £60 of the Company's ordinary stock.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 734.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
590,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
100,000	10	,,	7½	Do. 7 p.c.	13¼—14½	..	5 3 5
200,000	5	May 12	6½	Bombay, Ltd.. . . .	6½—6¾	..	4 16 4
140,000	5	,,	6½	Do. New, £4 paid	4¾—5¼	..	4 18 11
50,000	10	Aug. 31	14	Bourne-) 10 p.c. . .	28—29*	..	4 16 7
251,810	10	,,	7	mouth Gas) B 7 p.c. .	14½—15¾*	..	4 10 4
53,200	10	,,	6	and Water) Pref. 6 p.c.	14—15*	..	4 0 0
380,000	Stk.	Aug. 12	12	Brentford Consolidated	235 240	..	5 0 0
300,000	,,	,,	9	Do. New . . .	177—182	..	4 18 10
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,750	,,	June 10	4	Do. 4 p.c. Deb. .	102—105	..	3 16 2
220,000	Stk.	Mar. 10	11†	Brighton & Hove Orig.	212—217	..	5 1 5
246,320	,,	,,	8†	Do. A. Ord. Stk. .	150—155	..	5 3 3
460,000	20	Apl. 14	10	British	39—40	..	5 0 0
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	114—118	..	5 1 9
165,700	,,	,,	4½	Do. do. 3½ p.c. .	88—93	..	4 16 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd.	11—11⅛	+¼	6 1 9
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
150,000	20	July 14	8½	Cagliari, Ltd.	21—23	..	7 3 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
10 ,000	10	Apl. 28	4½	Do. 4½ p c Pref.. .	9¼—9¾	..	4 12 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0
1,375,000	Stk	Aug. 31	5 1/16	Commercial 4 p c Stk. .	108—112*	..	4 12 10
560,000	,,	,,	5	Do. 3½ p.c. do. .	104—107*	..	4 13 6
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	84—86	−1	4 10 11
800,000	Stk.	June 10	6	Continental Union, Ltd.	102—107	..	5 12 2
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,090	10	July 14	11	European, Ltd. . . .	19—20	..	5 11 0
354,060	10	,,	11	Do. £7 10s. paid	13—14	..	5 17 10
15,243,200	Stk.	Aug. 12	4 1/16	Gas-) 4 p.c. Ord. . .	92—94	..	4 13 7
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	86—88	..	3 19 7
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	107—110	+1	3 12 9
4,194,975	,,	June 29	3	Coke) 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92—97	..	5 3 1
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk,	May 12	10	Imperial Continental .	200—205	..	4 17 7
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb Red.	95—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	112—117*	..	5 2 7
561,000	Stk.	Aug. 31	10	Liverpool United A . .	217—219	+½	4 11 4
718,100	,,	,,	7	Do. do. B . .	158½—160.*	..	4 7 3
306,083	,,	June 29	4	Do. do. Deb. Stk.	105—108	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Apl. 5	5	Met. of) 5 p.c. Deb..	102—105	..	4 15 3
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd. . .	9½—10⅝	..	6 13 4
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	104½—105	+¼	4 5 9
406,·25	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20*	..	5 0 0
52,940	1	,,	7	Do. 7 p.c.	13—14*	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	140—145	..	5 10 4
600,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5½—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,493	5	Apl. 28	10	Primitiva Ord. . . .	4—4½	..	11 2 2
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4—4½	..	5 11 1
492,200	10	June 1	4	Do. 4 p.c. Deb. .	92—94	..	4 5 1
851,070	10	Apl. 28	7	River Plate Ord. . . .	11—11½	+¼	6 1 9
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
250,000	10	Mar. 29	7	San Paulo, Ltd. . . .	11—12	..	5 16 8
70,000	50	June 29	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
135,000	Stk.	Mar. 10	10	Sheffield A	237—239	..	4 3 8
209,984	,,	,,	10	Do. B	235—238	..	4 4 0
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
123,998	Stk.	—	5	Shrewsbury Ord. 5 p.c.	—	..	—
70,000	10	May 27	11	South African	15—16	..	6 17 6
6,250,000	Stk.	Aug. 12	5⅛	South Met., 4 p.c. Ord.	124—126	..	4 7 3
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	87—89	..	3 7 5
575,000	Stk.	Aug. 31	5⅛	S'th Suburb'n Ord. 5 p.c.	115—120*	..	4 11 8
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	118—123*	..	4 1 4
112,533	,,	July 14	5	Do. 5 p.c. Deb. Stk.	133—138	..	3 12 6
380,940	Stk.	May 12	5	Southampton Ord. . .	105—110	..	4 10 11
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¼	Tottenham) A 5 p.c. .	118—123*	..	5 1 8
325,520	,,	,,	4¼	and) B 3½ p.c. .	95—103*	..	4 15 0
182,380	10	June 10	8	Edmonton)			
149,900	10	July 1	5	Tuscan, Ltd.	8¼—8¾	..	9 2 10
30,000	Stk.	Aug. 31	7⅞	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
255,636	,,	,,	6⅞	Wands-) A 5 p.c. . .	148—153*	..	5 1 4
50,000	,,	,,	5 17/20	worth) B 3½ p.c. . .	118—123*	..	5 1 3
59,416	,,	June 29	3	and) C 3½ p.c. . .	100—105*	..	5 3 0
745,872	,,	Aug. 12	5	Putney) 3 p.c Deb. Stk.	78—83	..	5 12 8
85,000	,,	,,	5	West Ham 5 p.c. Ord. .	95—100	..	5 0 4
160,000	,,	June 29	4	Do. 5 p.c. Pref. . .	115—120	..	4 3 4
				Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div. † Next dividend will be at this rate.

The New Export Incandescent Lighting Company, Limited, have just issued an illustrated catalogue, for the coming season, of their incandescent fittings and requisites, and latest novelties.

We have received a copy of the Welsbach Incandescent Gas-Light Company's price list for 1904-5, which contains hundreds of illustrations of the burners, globes, pendants, stoves, &c., which they supply.

The Finance Committee of the Newport Corporation report that they have received a notice from the Gas Company of their intention to appeal at the next Quarter Sessions against the increased assessment of their works.

Mr. Andrew Thomson, the Manager of the Inverness Corporation Gas-Works, was married on Wednesday last, in Glasgow, to Jessie Aitken Whyte, the eldest daughter of Mr. David Whyte, of Dunolly, Dumbreck, Glasgow.

Messrs. Joseph Taylor and Co., of Bolton, have received an order from the Stirling Gas Company for one of their latest makes of solid plate lead saturators, including the supply and erection of all the lead-work in connection with the new sulphate plant about to be erected.

The Limerick Corporation have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for four purifiers, 30 ft. by 20 ft. by 5 ft. deep, with 18-inch connectionless Weck's centre-valve. The work has to be completed within three months from date of order.

Under the auspices of the Glasgow and West of Scotland Technical College, a course of twenty-five lectures on "Gas Manufacture" is to be delivered on Saturday evenings during the winter, in the Young Laboratory Buildings, No. 60, John Street, Glasgow, by Mr. Henry O'Connor, Assoc.M.Inst.C.E., of Edinburgh. This is the first half of the course, which consists in all of fifty lectures.

The Directors of Stewarts and Lloyds, Limited, have declared an interim dividend for the half year ending June 30 at the rate of 9 per cent. per annum on the ordinary shares.

The Oldham Corporation have instructed Messrs. Samuel Cutler and Sons, of Millwall, to convert four purifiers at their Hollinwood station to the Jäger system of purification.

Tenders for £12,000 of new ordinary 5 per cent. stock of the Walker and Wallsend Union Gas Company were opened last Friday. Applications were received for considerably over the amount required; and the tenders were made out at prices ranging from £130 to £136 10s. per cent.

Orders have been placed with Messrs. Ashmore, Benson, Pease, and Co., of Stockton-on-Tees, for a cast-iron tower scrubber for Clonmel and a steel tank and gasholder for Gorey (Ireland); and the firm are also supplying a large tank and gasholder for the Cargo Fleet Iron Company's new works at Middlesbrough.

The Local Government Board have intimated to the Isle of Wight Rural District Council that one of their Inspectors will make a special investigation into the sanitary condition of the district in which the source of the water supply is situated. On this account, they withhold permission to borrow the money intended to enable the Council to extend the Sandown Water Company's supply to Brading.

The Richmond Gas Stove and Meter Company, Limited, are exhibiting at the Bakers and Confectioners' Exhibition now being held at the Agricultural Hall, occupying the same space as in previous years. The stand comprises a special assortment of their various manufactures; and they are making a special feature of ovens suitable for baking bread. The firm's Porcellanite finish for gas-fires also occupies a prominent position.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

RENTAL CLERK. No. 4262.
PREPAYMENT RENTAL CLERK. Maidenhead Gas Company. Applications by September 20.
MAIN AND SERVICE LAYER. No. 4261.
GAS APPARATUS ERECTOR. Biggs, Wall, and Co., London.

Situations Wanted.

COMMERCIAL MANAGER. "Routine," c/o Horncastle's, London, E.C.
TRAVELLER OR ASSISTANT. "G 10," c/o W. H. Smith and Son, Manchester.

Examinations in Gas Manufacture. No. 4263.

Partnership or Investment.

BY MANUFACTURER'S AGENT. No. 4264.

Plant, &c., for Sale.

PURIFIERS. Devonport Corporation. Offers by September 30.
STEEL GAS MAIN. Rotherham Corporation.
VERTICAL COMPOUND GAS COMPRESSING ENGINES. P. Sutcliff, Accrington.

Company Meeting.

BRITISH GASLIGHT COMPANY. London Offices, September 28, at Twelve o'clock.

TENDERS FOR

Breeze.

COMMERCIAL GAS COMPANY. Tenders by September 14.
SWANSEA GASLIGHT COMPANY.

Carbon.

COMMERCIAL GAS COMPANY. Tenders by September 14.

Coke.

COMMERCIAL GAS COMPANY. Tenders by September 14.
SHEPPEY GAS COMPANY. Tenders by September 20.

Lime.

COMMERCIAL GAS COMPANY. Tenders by September 14.

Station Meter.

CHORLEY GAS-WORKS. Tenders by September 20.

Sulphuric Acid.

LEICESTER CORPORATION. Tenders by September 17.
HINDLEY URBAN DISTRICT COUNCIL. Tenders by September 20.

Tar and Ammoniacal Liquor, &c.

BRIDGWATER COLLIERIES COKE-WORKS. Tenders by September 26.
ROTHERHAM GAS-WORKS. Tenders by September 20.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. Tenders by September 20.
GAINSBOROUGH URBAN DISTRICT COUNCIL. Tenders by September 28.
MIRFIELD GAS COMPANY. Tenders by September 26.
KNUTSFORD LIGHT AND WATER COMPANY. Tenders by September 24.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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Resists 4500° Fahr. Best for GAS-WORKS.
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Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

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PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
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Can be Exchanged for Spent Oxide.
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MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

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H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

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Telegrams: "METROGAS, LONDON."

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PATENTS AND TRADE MARKS
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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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Apply, by letter, to No. 4261, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a First-Class Gas Apparatus ERECTOR, to erect a complete Gas-Works Abroad. Must be a First-Class man, and have experience in erecting Water-Gas Plant. Must speak Spanish. Good salary given to a high-class man.
Apply to BIGGS, WALL, & Co., Gas Engineers, 13, Cross Street, FINSBURY, E.C.

CLERK wanted in Rental and Fittings Department in a Provincial Gas-Works Office. Experience in Gas Rentals (Ordinary and Automatic), Residuals, and Fittings essential. Wages 27s. 6d. to 30s. per week.
State Age, present Employment, and full Particulars, to No. 4262, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PREPAYMENT Rental Clerk required.
Must be competent to collect the money from Prepayment Meters with the assistance of a Fitter, to keep the Rental Books, and devote his time to the Company's service.
Salary to commence at 30s. per week.
Applications, stating Age and Experience, with *copies* of Testimonials, to be sent on or before Sept. 20, to the SECRETARY, Gas Company, MAIDENHEAD.

TO BRICK AND CEMENT MAKERS AND OTHERS.
THE Swansea Gaslight Company have for sale good ordinary COKE BREEZE, for Shipment or on Rail.
Apply MANAGER, Gas-Works, SWANSEA.

FIVE Million Gallons Coal-Gas Tar wanted per Year. Offerings in large or small quantities—at fixed price—for period of from One to Five Years requested.
Address: EDWARD RONEY, C.E., 9, Queen's Road, Bootle, LIVERPOOL.

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FOR SALE, about 120 yards of 20-inch STEEL GAS-MAIN. Splendid condition. Inspection invited.
FRANK A. WINSTANLEY,
Engineer and Manager.

FOR SALE—Two nearly new Vertical Compound Gas Compressing Engines, Belt Driven, Brass Cylinders, 4⅞-in. and 6½-in. diameter, 8-inch Stroke, complete with High-Pressure Delivery Valves and Pressure Gauges, &c., for 250 lbs. pressure. Makers, J. & E. Hall, Ltd., Dartford.
P. SUTCLIFFE, Hyndburn Road, ACCRINGTON.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.
New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

PURIFIERS FOR SALE.
The Devonport Corporation invite OFFERS for TWO PURIFIERS 16 ft. by 12 ft by 5 ft. deep, together with lifting apparatus.
The boxes are made with planed joints, and are in good condition. They can be seen and examined on application at the Gas-Works, and must be taken down and removed by the purchaser.
Sealed Tenders, endorsed "Offer for Purifiers," to be sent to R. J. Fittall, junr., Town Clerk, Devonport, on or before the 30th of September, 1904.
SIDNEY E. STEVENSON,
Engineer and Manager.
Gas-Works, Devonport.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

COKE.
THE Directors of the Sheppy Gas Company invite TENDERS for the purchase of their surplus make of COKE (about 4500 chaldrons) to be produced during the Year ending the 30th of September, 1905, at their Works situated on the Medway near Sheerness.
Particulars may be obtained from the undersigned, to whom all Tenders must be delivered not later than Tuesday, the 20th of September.
The Directors do not bind themselves to accept the highest or any Tender.
H. BARBER,
Manager and Secretary.
Offices: 2, Trinity Road, Sheerness.

LIME.
THE Directors of the Commercial Gas Company will be prepared to receive TENDERS not later than the 14th inst., for the supply of WHITE FLARE BURNT CHALK LIME to their Stepney, Wapping, and Poplar Works over the Twelve Months ending the 30th of September, 1905.
Particulars may be obtained from the Engineer at the Offices of the Company, Stepney, E.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the lowest or any Tender.
Commercial Gas-Works.
Stepney, E., Sept. 2, 1904.

CARBON.
THE Directors of the Commercial Gas Company are prepared to receive TENDERS not later than the 14th inst., for RETORT CARBON over Twelve Months, from the 30th of September, 1904, estimated at the following quantities.
At the Stepney Works on the Regent's Canal 35 Tons.
At the Wapping Works on the River Thames 100 Tons.
At the Poplar Works on Bow Creek (free waterway), 140 Tons.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Commercial Gas-Works,
Stepney, E., Sept. 2, 1904.

COKE.
THE Directors of the Commercial Gas Company are prepared to receive TENDERS not later than the 14th inst., for 20,000 tons of Coke, loaded into barges alongside their Poplar Works, on the River Lea, during the Twelve Months ending the 30th of September, 1905.
Two-thirds of the above quantity to be taken between the 1st of October, 1904, and the 31st of March, 1905, in equal monthly quantities, and one-third to be taken between the 1st of April, 1905 and the 30th of September, in equal monthly quantities.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Commercial Gas-Works,
Stepney, E., Sept. 2, 1904.

BREEZE.
THE Directors of the Commercial Gas Company are prepared to receive TENDERS for the surplus BREEZE produced at their several Works, for the Twelve Months ending the 30th of September, 1905.
The quantities are estimated to be as under; but the same cannot be guaranteed, and may be more or less:—
At the Stepney Works on the Regent's Canal—
1000 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
1000 ,, (of 20 Cwt.) of Rough Pan Breeze.
At the Wapping Works on the River Thames—
2200 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
2200 ,, (of 20 Cwt.) of Rough Pan Breeze.
At the Poplar Works in Bow Creek (free waterway)—
5000 chaldrons (of 18 Cwt.) of Fine Coke Breeze.
6000 ,, (of 20 Cwt.) of Rough Pan Breeze.
The Tenders may be for the whole or for One or more Works separately.
The Contractors must give Security to remove the Breeze as it accumulates, to pay for the same monthly, and generally for the due fulfilment of the Contract.
The Form of Agreement to be signed can be seen at the Company's Offices.
Tenders, sealed and endorsed "Tender for Breeze," to be delivered here not later than the 14th inst.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Commercial Gas-Works.
Stepney, E., Sept. 2, 1904.

MIRFIELD GAS COMPANY.
THE Directors are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works, Ravensthorpe, for One Year from Nov. 1 next. For Tar, state price per Ton; and for Ammoniacal Liquor, at per ounce strength (Wills Test)—both delivered f.o.b. Ravensthorpe. Monthly payments.
Any further Information will be given on application to the Company's Manager, Mr. J. W. Turner.
Tenders to be sent in, endorsed and addressed to M. Fox, Esq., J. P., Chairman, not later than Monday, the 26th of September.
By order,
SAMUEL DAY,
Secretary.
Gas Company's Office,
Ravensthorpe, via Dewsbury,
Sept. 10, 1904.

THE Knutsford Light and Water Company invite TENDERS for their production of GAS TAR and AMMONIACAL LIQUOR for the Twelve Months ending Aug. 31, 1905. State prices of Liquor of 5°, 5½°, 6°, 6½°, and 7° Twaddel.

The Company do not bind themselves to accept the lowest or any Tender.

Tenders to be sent in on or before the 24th of September addressed to the Chairman.

HINDLEY URBAN DISTRICT COUNCIL.

THE Gas Committee of the above Council are prepared to receive TENDERS for SULPHURIC ACID for the manufacture of Sulphate of Ammonia up to the 31st of March, 1905. The approximate quantity required is about 50 Tons.

Sealed Tenders, endorsed "Sulphuric Acid," to be delivered to the undersigned not later than 10 a.m. on Tuesday the 20th inst.

The lowest or any Tender not necessarily accepted.

H. O. TIMMINS,
Engineer.

Sept. 10, 1904.

COUNTY BOROUGH OF ROTHERHAM.

THE Gas-Works Committee are prepared to receive OFFERS for the purchase of TAR and AMMONIACAL LIQUOR produced at the Gas-Works for One Year from the 1st of October, 1904 (with an alternative price for 3 Years).

Estimated quantity of Tar, about 900 Tons.
Do. Do. Do. Liquor, 2800 Tons.

Form of Tender and further Information may be obtained upon application to the Secretary, Gas-Works, Rotherham.

Offers, endorsed "Tar" or "Liquor" respectively, to be sent to me not later than the 20th inst.

W. J. BOARD,
Town Clerk.

Town Hall, Rotherham,
Sept. 6, 1904.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

TO TAR DISTILLERS.

THE Directors of the above Company are prepared to receive TENDERS for surplus TAR produced over Twelve Months from Oct. 1 next.

Approximate quantity, 70,000 Gallons.

Tenders, stating price per Gallon or per Ton in Contractor's Tank-Waggons at the Company's Works, to be sent to the undersigned, marked "Tender for Tar," on or before Tuesday, Sept. 20, inst.

F. SMALLBONE,
Manager and Secretary.

Offices, Snake's Lane,
Woodford Green, Sept. 8, 1904.

GAINSBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR TAR.

THE Gas Committee of the above Council are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works for a period of Twelve Months from Oct. 1, 1904.

Probable quantity, 450 Tons.

Further Particulars may be obtained on application to the undersigned.

Sealed and endorsed Tenders, addressed to the Chairman of the Gas Committee, must be delivered at the Gas-Works not later than Sept. 28, 1904.

The Committee do not bind themselves to accept the highest or any Tender.

JOHN BALDWIN,
Manager.

Gas-Works, Gainsborough,
Sept. 8, 1904.

BOROUGH OF CHORLEY GAS-WORKS.

STATION METER.

THE Corporation are prepared to receive TENDERS from Meter Makers for the supply, delivery, and erection at the Gas-Works, Chorley, on foundations to be provided by the Corporation, of a STATION METER, to pass 15,000 cubic feet of Gas per hour. Persons tendering to state in their Tender the earliest date on which they will undertake to complete the work.

Specification of Meter tendered for to be sent to Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, endorsed "Meter," to be delivered to the undersigned not later than Tuesday, Sept. 20, 1904.

The Corporation do not bind themselves to accept any Tender.

By order,
JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
Sept. 5, 1904.

LEICESTER CORPORATION.

SULPHURIC ACID.

THE Gas and Electric Lighting Committee of the above Corporation are prepared to receive TENDERS for the supply of SULPHURIC ACID made from either native Sicilian Brimstone, recovered Sulphur, or Pyrites. Specific gravity in each case to be stated. The price to include free delivery by rail into elevated Tanks, 27 feet high, at the Chemical Works, Aylestone Road. Probable quantity, about 1800 Tons, to be delivered as required during the ensuing Twelve Months.

Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices, not later than 11 o'clock a.m. on Saturday, Sept. 17, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer.

Offices: Millstone Lane,
Leicester, Sept. 6, 1904.

BRIDGEWATER COLLIERIES COKE-WORKS.
(THE EARL OF ELLESMERE).

TENDERS are invited for the Light Oil produced at the above Works for a period of Six or Twelve Months from the 1st of November, 1904, delivered into Contractor's Tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley Branch of the Lancs. and Yorks. Railway; or at the Brackley Siding on the Little Hulton Mineral Branch of the L. and N. W. Railway.

Tenders, endorsed "Tender for Light Oil," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Office, 4, Chapel Walks, Manchester, on or before the 26th inst.

Manchester, Sept. 8, 1904.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 28th inst., at Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, to elect Two Directors in the place of those who go out by rotation, and to appoint Two Auditors.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 17th and RE-OPENED on the 29th inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 7, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

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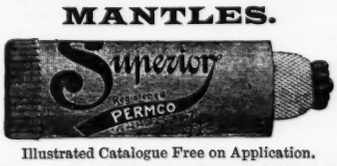

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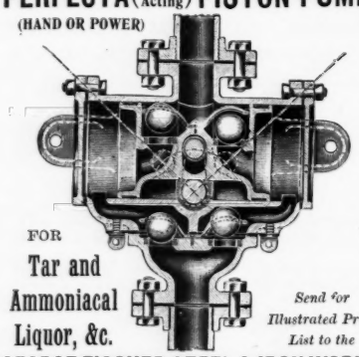
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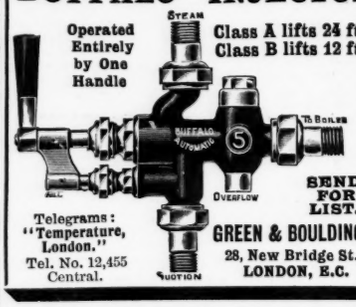

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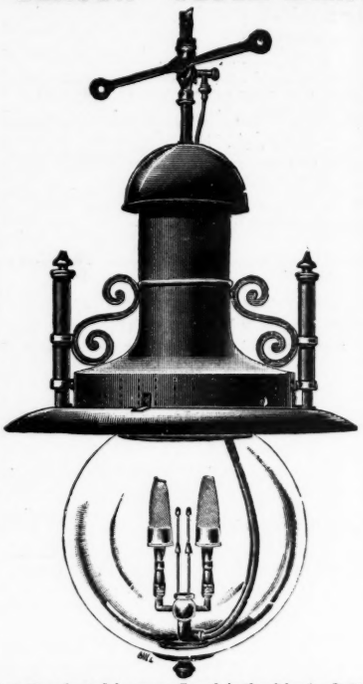
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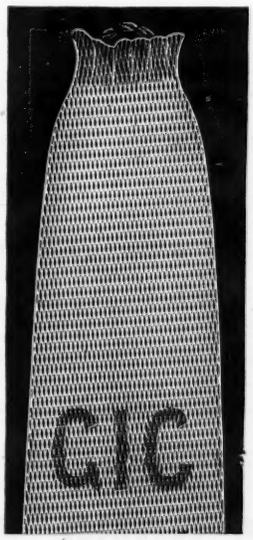

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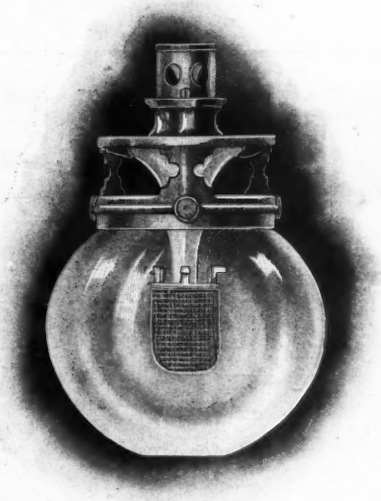

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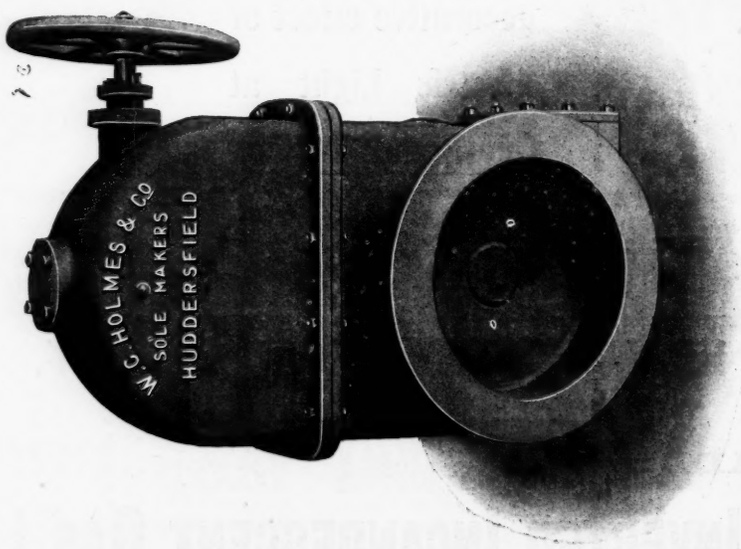

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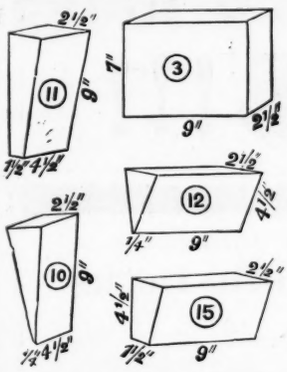

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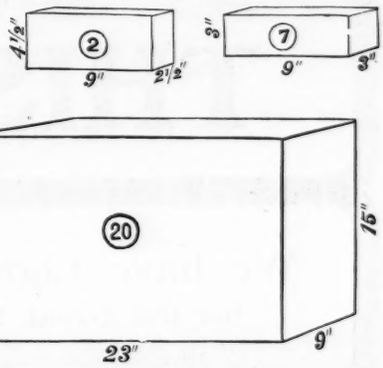

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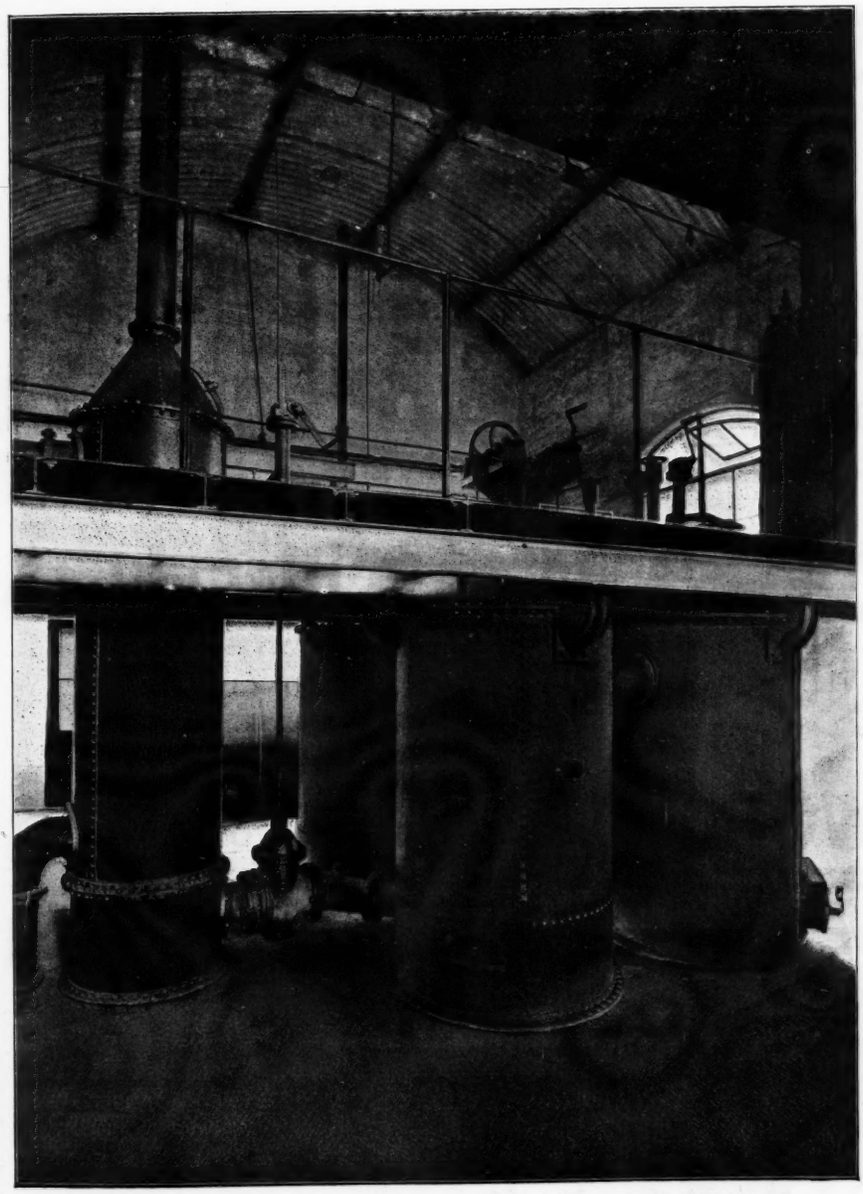

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Guaranteed Results per 1000 Cubic Feet of Gas.

Calorific Power, 315 B.T.U. per cubic foot.

Use of Carbon in the Generators, 22 lbs.

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CO_2	3·5
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Difference	3·3

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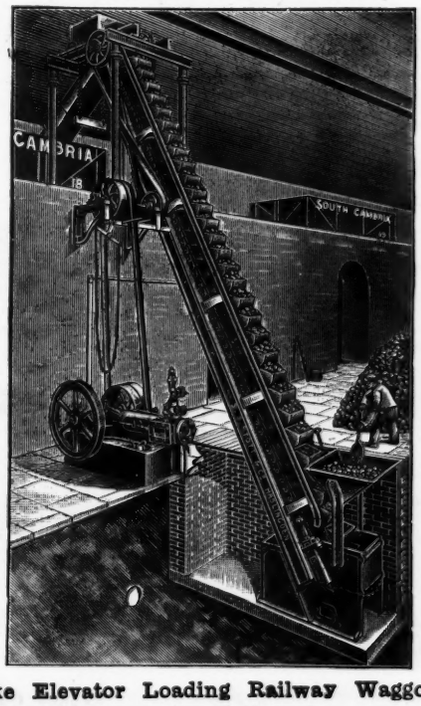

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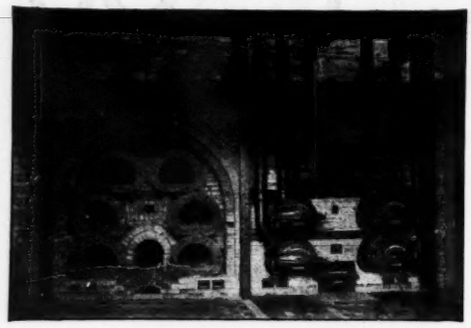

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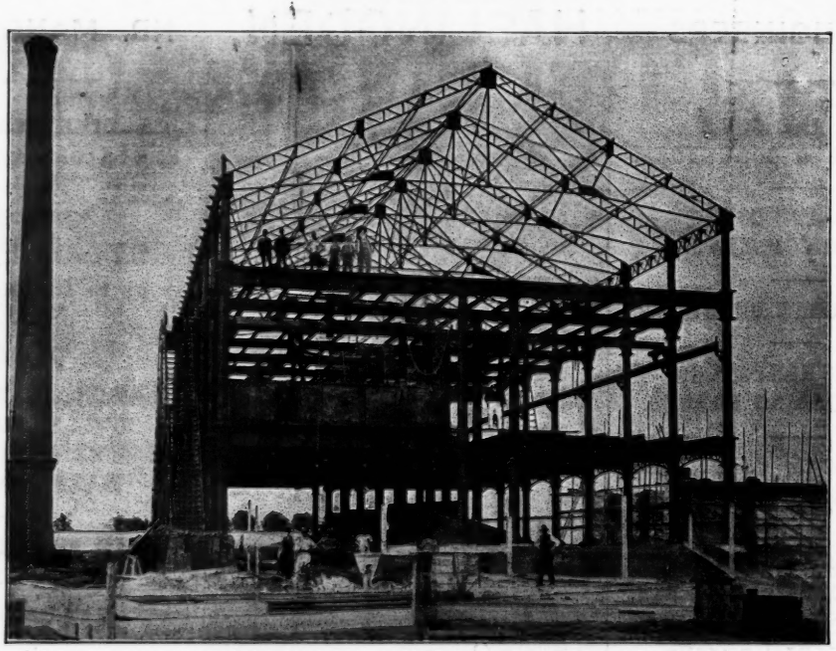

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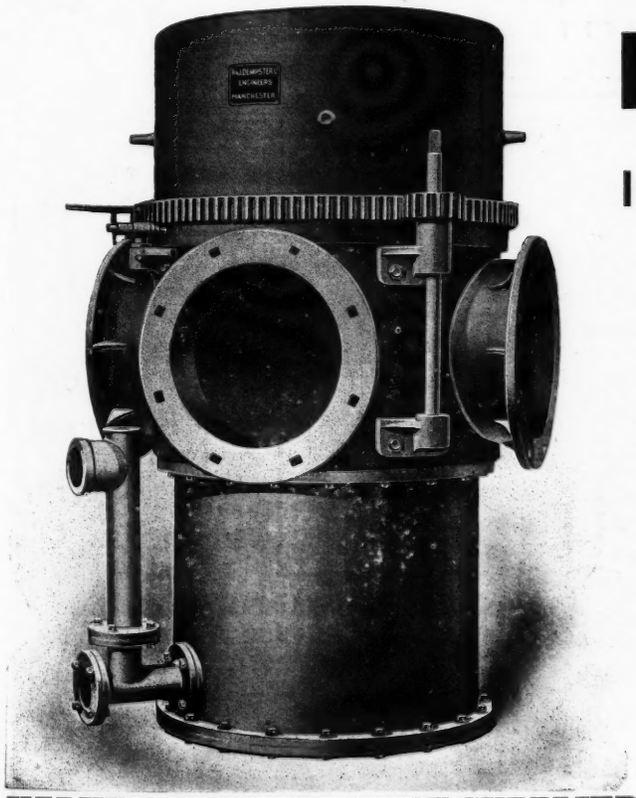

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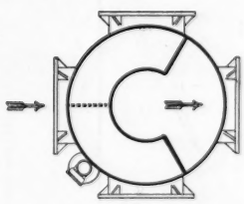

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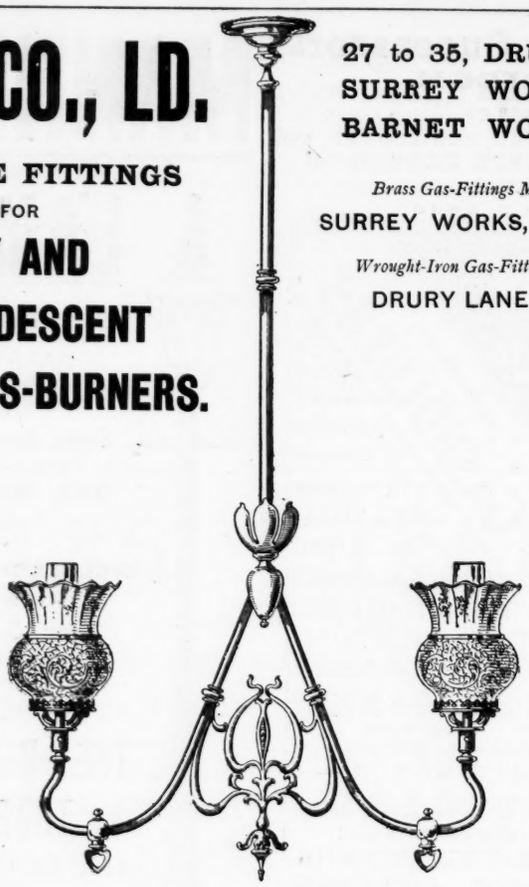

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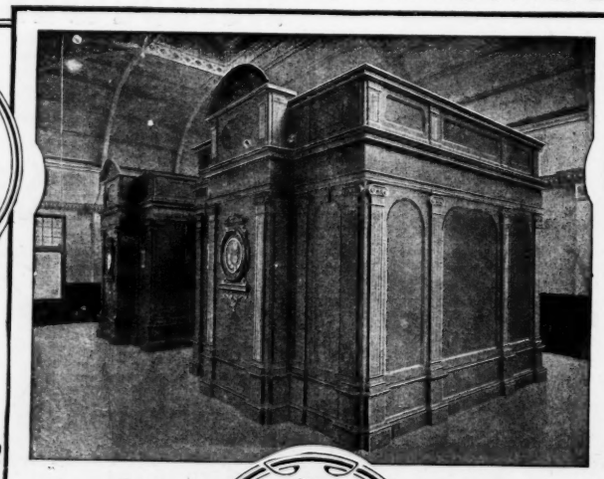

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